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GENDER STEREOTYPING WITHIN CAREER AND TECHNICAL EDUCATION:
EXPLORING RELATIONSHIPS AMONG GENDER, COURSETAKING, AND
OUTCOMES OF HIGH SCHOOL CTE STUDENTS

By

Stephanie A. Fluhr

A Dissertation
Submitted to the Faculty of the
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of the University of Louisville
in Partial Fulfillment of the Requirements
for the Degree of

Doctor of Philosophy

Department of Leadership, Foundations, and Human Resource Education
University of Louisville
Louisville, Kentucky

May 2014

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DEDICATION

This dissertation is dedicated to my children.

May your education be the journey of your lives and the key to unlocking your dreams.

ACKNOWLEDGEMENTS

I would be remiss if I did not first express my sincerest appreciation for my dissertation chair, Dr. Namok Choi. Whether it was sheer luck or fate, I will be forever grateful that you were assigned as my advisor. I doubt that many others would have seen the load on my plate (three children—two of whom were born throughout the course of my studies—and a demanding full-time job) and believed in me the way that you did. Thank you for your encouragement and guidance throughout this journey. In addition, I would also like to thank my committee members: Dr. Marco Munoz, Dr. James Stone, and Dr. Meera Alagaraja for your time and your feedback that helped me to improve my research.

To my wonderful, amazingly supportive husband, Buddy, words cannot express just how thankful and appreciative I am of all of your love and support throughout this process. Thank you for understanding how important this was to me and for helping me to achieve my dreams. From taking the kids grocery shopping or to various activities around town so that I could do homework or write in peace, you always found a way to help me out. You are my soul mate and the best teammate I could have ever wished for. I could not have done this without you.

Although they likely won't remember much about this time, I also owe my children heartfelt gratitude as well. Luke, Kol, and Eli: Thank you for all of those times you let Mommy do her homework. Thank you for letting others take care of you while I

went to class. I know I missed out on some fun times with you guys, but you were always on my mind and always in my heart. Believe me when I say that I did all of this for you. I wanted to be the best role model you could ever have. I want you to grow up knowing that anything is possible through hard work and persistence. The sky is the limit for you guys and I hope that I have proven this to you.

Next, it is imperative that I thank my parents, for they are the ones who helped to ingrain the values of education and hard work within me. It is my father who never allowed me to set limits for myself and who taught me “If you believe it, then you can achieve it.” If not for all of your lessons about never settling for less than my best (and for never letting me win at anything), I’d surely not be the person that I am today. You helped to instill in me a drive for perfection that has helped me to be successful at just about anything I’ve put my mind to. While my father taught these lessons outright, it is my mother who lived them and who set the example of what hard work, determination, and ambition can really mean in a person’s life. You set your goals high and did whatever it took to achieve them, all while balancing family demands and thousands of ball game attendances. I hope you know that your efforts did not go unnoticed.

For all of those educators whose paths crossed mine from K-12 and then beyond, I am also thankful for you. I was truly blessed to have some amazing classroom teachers throughout my entire educational career. You inspired, pushed, and motivated me to learn. You were the models of higher education to which I would one day aspire and although I might not have told you then just how much I appreciated you, I look back fondly upon you all now and am thankful for all of my classroom experiences.

Finally, special thanks goes out to my extended family and friends, especially my grandparents who are always more than willing to lend a helping hand and who have been two of my biggest cheerleaders throughout life. I sincerely appreciate your understanding throughout this process and I thank you for still being there for me even though I had little to offer in return. You guys are the best and I am lucky to have you all in my life!

ABSTRACT

GENDER STEREOTYPING WITHIN CAREER AND TECHNICAL EDUCATION: EXPLORING RELATIONSHIPS AMONG GENDER, COURSETAKING, AND OUTCOMES OF HIGH SCHOOL CTE STUDENTS

Stephanie A. Fluhr

February 18, 2014

This dissertation explored the relationships among gender, coursetaking, and student outcomes of high school CTE students. The variables analyzed within this study were selected based upon an extensive review of existing literature on gender, stereotypes, occupation, nontraditional careers, and CTE coursetaking and policy. The sample examined in this study came from a Midwestern state's database of CTE students that were enrolled in high school CTE courses from 2010-2012.

Operating under a theory that gender segregation with CTE leads to a continuance of gender segregation in the workforce at large, the purpose of this study was to add to the existing body of knowledge regarding gender equity in the workforce and the persistence of occupational gender segregation by ascertaining the extent of the relationships between gender and high school CTE coursetaking. Investigation of this topic filled a void in empirical analyses of the impact of gender on CTE with respect to recent legislative changes intended to encourage increased gender equity in programs and courses. In order to assess these relationships, logistic regression and multinomial

logistic regression analyses were conducted. Additionally, a factorial ANOVA analysis was used to investigate estimated wage differences for male and female CTE completers.

The results of this study indicated that gender is a significant predictor of CTE coursetaking, although its effect is small. Specifically, the findings suggest that gender gaps in coursetaking have narrowed and that both male and female students appear to be pursuing nontraditional course enrollment across program areas. Gender was also found to be a significant predictor for earning industry certifications, with females more likely to earn an industry certification than male students. Additionally, the results indicated that gender, industry certifications, and program area all had a significant relationship with nontraditional student outcomes. Student transitions to employment or postsecondary study (either in a field related to the high school CTE program of study or in an unrelated field) could be predicted based upon these variables. Finally, when analyzing potential future earnings, program area rather than gender produced the largest effect and explained the greatest portion of wage disparities amongst individual students.

TABLE OF CONTENTS

	PAGE
ACKNOWLEDGEMENTS.....	iv
ABSTRACT.....	vii
LIST OF TABLES.....	xii
I. INTRODUCTION.....	1
Problem Statement.....	3
Study Significance.....	6
Research Questions.....	7
Limitations.....	7
Organization of the Study.....	8
Definition of Key Terms.....	8
II. LITERATURE REVIEW.....	11
Sex and Gender.....	11
Gender Stereotypes.....	15
Gender and Occupation.....	19
Nontraditional Careers.....	28
Career and Technical Education.....	35
III. METHOD.....	54
Study Purpose.....	54

Research Design.....	54
Research Questions.....	55
Study Participants.....	55
Validity.....	56
Procedure.....	57
Study Variables.....	57
Statistical Analysis.....	60
Research Question 1.....	60
Research Question 2.....	60
Research Question 3.....	64
Research Question 4.....	65
IV. RESULTS.....	68
Sample Characteristics.....	68
Data Analysis.....	69
Research Question 1.....	69
Research Question 2.....	72
Research Question 3.....	75
Research Question 4.....	88
V. DISCUSSION.....	98
Study Results.....	98
Gender and Coursetaking.....	98
Gender and Industry Certifications.....	99
Nontraditional Student Outcomes.....	100

Gender, Program Area, and Salary.....	104
Study Implications.....	105
Study Conclusions.....	108
Study Limitations.....	111
Future Research.....	112
REFERENCES.....	116
APPENDIX A: Summary of Sex and Gender Literature.....	133
APPENDIX B: Summary of Gender Stereotypes Literature.....	135
APPENDIX C: Summary of Gender and Occupation Literature.....	138
APPENDIX D: Summary of Nontraditional Careers Literature.....	140
APPENDIX E: Summary of CTE and Coursetaking Literature.....	143
APPENDIX F: Institutional Review Board Approval Letter.....	145
CURRICULUM VITA.....	147

LIST OF TABLES

TABLE	PAGE
1. Summary of Research Questions, Variables, and Statistical Analysis.....	67
2. Coursetaking by Gender.....	69
3. Logistic Regression Analysis of Nontraditional Coursetaking.....	71
4. Certifications Earned by Gender.....	72
5. Logistic Regression Analysis of Industry Certifications.....	73
6. Transition Outcomes for All Completers.....	76
7. Transition Outcomes for Male Nontraditional CTE Completers.....	78
8. Transition Outcomes for Female Nontraditional CTE Completers.....	80
9. Multinomial Logistic Regression Analysis of Student Transition Outcomes.....	83
10. Means and Standard Deviations for Estimated Future Salary by Gender and Program Area.....	90
11. Factorial ANOVA: Gender and Program Area on Estimated Salary.....	95
A1. Summary of Sex and Gender Literature.....	133
A2: Summary of Gender Stereotypes Literature.....	135
A3: Summary of Gender and Occupation Literature.....	138
A4: Summary of Nontraditional Careers Literature.....	140
A5: Summary of CTE and Coursetaking Literature.....	143

CHAPTER I

INTRODUCTION

Steady increases in female workforce participation have led to a more balanced workforce than at any time in United States history. However, despite this numerical balance, careers remain as gender segregated as ever before, with most so heavily skewed that they can still be easily identified as either male-dominated or female-dominated occupations (U.S. Census Bureau, 2012). Gender stereotypes and assumptions are typically singled out as primary causes of this divide (Couch & Sigler, 2001; Evans & Diekmann, 2009) along with gender self-concept and occupational compatibility (Gottfredson, 1981), personal values (Weisgram, Dinella, & Fulcher, 2011), parental expectations (Jacobs, Chhin, & Bleeker, 2006; Schuette, Ponton, & Charlton, 2012), and educational experiences (Eardley & Manvell, 2006; Sayman, 2007).

Although unconventional social wisdom might suggest that males and females are more equal than ever before, the research on equality in the workforce and occupational stereotyping does not support this belief. Despite consistent increases in female occupational participation over the last four decades that substantiate that women in the workforce are here to stay, changes in the gender composition of many careers have not manifested themselves. What is apparent, however, is that redefined 21st century gender roles are emerging. While many cling to the vestige of the two parent family unit with the father as the provider and the mother as the caregiver, this reality is becoming more

antiquated as times goes on. Females have increasingly become the primary wage earners (U.S. Bureau of Labor Statistics, 2011), serving as the main source of family income in 40% of households with children (Wang, Parker, & Taylor, 2013), and it is incumbent upon them to earn a sufficient wage to provide for their family. Time and again, male-typed careers have proven to offer higher salary and benefits than stereotypical feminine careers (Hogue, DuBois, & Fox-Cardamone, 2010). Although the gender wage gap has narrowed to its closest point yet, women still make approximately 18% less than men (Hegewisch, Williams, & Zhang, 2012).

A multitude of theories exist in an attempt to explain the social phenomenon that is occupational gender segregation. From social role theory (Eagly, 1997) to circumscription and compromise (Gottfredson, 1981) to preference theory (Hakim, 2006) to tokenism (Kanter, 1977) to educational tracking (Ainsworth & Roscigno, 2005; Eardley & Manvell, 2006), there are no shortages of premises offered to explicate the problem and propose solutions. Although scholars remain divided on the cause, there is little dispute that gender segregation in the workforce is a genuine concern that warrants a resolution.

Whether or not men and women select careers based upon internal preferences (Evans & Diekmann, 2009; Hakim, 2006) or if their choices are a byproduct of early gender socialization (Bussey & Bandura, 1999; Tobin et al., 2010) remains a healthy debate amongst scholars. Historically, early studies of gender were primarily concerned with understanding the differentiating behaviors and belief systems that separated males and females. However, as scholarly understanding of the concepts of masculinity and femininity have evolved over time, researchers have developed a greater comprehension

of how these concepts impact human behavior (Smiler, 2004), especially in terms of life choices relating to education and occupation. Current research suggests that gender socialization and the learned stereotypes and expectations that accompany it begins early in life and strongly influences coursetaking patterns and career preferences (Bussey & Bandura, 1999; Heilman, 2001; Oswald, 2008). It appears that the future direction of research on gender and occupation centers around developing an understanding and awareness of this duality in order to bring balance to the historically segregated system of occupations and wages.

Problem Statement

Understanding the causes of occupational gender segregation and finding solutions to remedy this issue are more than just a social crusade for equality; rather, it is an avenue to end the marginalization of specific groups of people from both a social and economic perspective. Nontraditional careers have been shown to yield benefits for both males and females, giving females the opportunity to earn higher salaries (Hogue et al., 2010) and males the opportunity to find employment in an increasingly crowded job market (Dodson & Borders, 2006). Members of both sexes have plenty to gain from a more gender-balanced workforce, but turning the tide of decades of segregation is much easier said than done.

Educationally and occupationally, gender segregation is nearing a tipping point. Colleges turn out more highly educated women than men each year. At some point, the economics of supply and demand will take over and there will not be enough female-typed jobs available, necessitating the entry into male-dominated fields. Making this scenario even more likely is the fact that service industry jobs (a female-dominated

sector) are projected to grow faster and in greater quantity than goods-producing or manufacturing jobs (U.S. Bureau of Labor Statistics, 2012). However, the sex segregation of jobs gets an early start and is in part influenced by gender segregation in vocational training (Ainsworth & Roscigno, 2005).

Education has been viewed as a potential equalizer in the gender equity discourse, but research has shown conflicting results. While post-secondary degree attainment among women is at its highest level ever (NCES, 2012), secondary education programs such as career and technical education (CTE) remain highly gender segregated despite years of reforms aimed at bringing about greater equity (Eardley & Manvell, 2006; NWLC, 2005; Sayman, 2007). Research suggests that sex typing of jobs begins early in life (Gottfredson, 1981; Patterson, 2012) and is reinforced by the tracking of students into gender-specific education and vocational training programs (Ainsworth & Roscigno, 2005). This sorting mechanism helps perpetuate the cycle of placing women in female-dominated, lower wage fields and contributes to the persistence of the gender wage gap (Ainsworth & Roscigno, 2005; Compton, Laanan, & Starobin, 2010; Sayman, 2007).

Today's schools find themselves situated in a policy environment that promotes gender equity in educational access to a greater degree than at any previous time. Federal legislation such as Title IX and Perkins IV promote equal access for males and females in both educational programs and courses while also requiring data collection on gender-specific measures in addition to holding states accountable for developing plans to improve access and equity (NAPE, 2006; Eardley & Manvell, 2006). Based upon these measures, it might be rational to predict increased gender integration within gender nontraditional career programs, primarily in the form of increased participation rates

amongst males in female-dominated programs and females within male-dominated courses. Despite such legislative reform efforts, however, research suggests that gender stereotyping persists within CTE (Eardley & Manvell, 2006; Sayman, 2007; Ainsworth & Roscigno, 2005; Compton et al., 2010).

Career and technical education coursetaking and its subsequent impact on an individual's future career choice is not just an issue that affects a small subset of students. Almost every high school graduate takes at least one career tech course before graduating, with the average student taking approximately four such courses (NCES, 2003). Over one billion dollars is appropriated each year to states in support of career and technical education (Association for Career and Technical Education, 2013) and its influence on students is far reaching. Existing research supports the notion that the classes students take in high school can impact the type of college degree (Adelman, 2006) or the types of industry training and credentials that students earn, which in turn influences employment possibilities (Carl D. Perkins Career and Technical Education Improvement Act, 2006; NRCCTE, 2013). Therefore, it is crucial to continue to review participation trends within CTE in order to determine if the equity goals anticipated by Title IX and Perkins IV legislation are being fulfilled. Analyzing the link between gender and career and technical experiences may very well yield information that can help to reverse the trend of occupational sex segregation, close the gender wage gap, and lead to the kind of equal educational and vocational training access envisioned by federal CTE legislation.

Study Significance

The goal of this research is to examine the relationships between gender, secondary CTE coursetaking, and student outcomes in an effort to contribute to existing research on occupational gender segregation and to extend understanding of this phenomenon in order to provide insight that might mitigate its prevalence in the future. This study attempts to fill existing gaps in the literature in regards to these measures.

The findings from this study could have numerous implications in the policy, socioeconomic, and education domains. First, the findings from this study should be of interest to policymakers who focus on gender equity in education, given the current policy context surrounding CTE. Since gender equity in educational access has been the aim of several pieces of federal legislation, research that assesses the gender balance within CTE programs and coursework is relevant. This study will add to the literature by evaluating the reality of gender participation in CTE.

Next, the findings from this study should have socioeconomic implications. Despite increases in educational training (NCES, 2012) and occupational participation among females (U.S. Census Bureau, 2012), occupational segregation and the gender wage gap persist. The results from this study might provide a greater understanding of how gender participation in high school CTE coursework and programs contribute to the persistence of these gender-based issues. Additionally, educational decision makers might be able to use these results to gauge the extent of gender segregation within CTE in order to continue to develop avenues to encourage increased nontraditional participation within segregated programs and courses.

Research Questions

In order to accomplish the purpose of this study, the following research questions were addressed:

- 1) Is gender a significant predictor of nontraditional CTE coursetaking?
- 2) Is gender a significant predictor of CTE certifications/credentials earned?
- 3) What are the predicted postsecondary outcomes for male and female nontraditional CTE completers?
- 4) Is there a significant difference between the estimated wage earnings for male and female CTE completers?

Limitations

While this study is designed to explore the link between high school CTE students, coursetaking, and their postsecondary or employment outcomes, it is by no means an exhaustive study and cannot take into account every single factor that can influence student coursetaking patterns or outcomes. The dataset analyzed contains information on participation and completion rates of various CTE programs disaggregated by gender. It does not provide information on reasons or circumstances that may have impacted student participation.

Sampling is another limitation that could affect the generalizability of the results. The study focused on data from a single Midwestern state and gender participation and course offerings might not translate to other states. Additionally, the dataset was developed based upon data collected by others, such as self-reports of post-secondary transitions, potentially impacting the reliability of the measures.

Despite its limitations, current research concerning gender, CTE participation, and student outcomes is rather thin and this study could add to the existing literature and serve as a means to inform future policy decisions, curricular approaches, and student recruitment to CTE.

Organization of the Study

This study is organized into several sections. The introductory section explains the background of the problem as well as the purpose of the study. The review of literature on gender, stereotypes, occupation, and career and technical education is presented in Chapter 2. The study methodology, including research design, sampling, data collection, and analysis, is presented in Chapter 3. The results of these analyses are presented in Chapter 4. The study concludes with a discussion of the study findings, limitations, and implications for future research in Chapter 5.

Definition of Key Terms

A basic understanding of terminology is fundamental to this research study. The following definitions were used within the context of this study:

Career and technical education (CTE).

Career and technical education is defined as an educational program consisting of a combination of academic and technical courses that prepare students for postsecondary employment in a specific career field (U.S. Department of Education, 2009).

Gender.

Gender is defined as a learned behavioral aspect of an individual that is developed based upon biological, psychological, and sociological factors (Bussey & Bandura, 1999).

Gender Stereotypes.

Gender stereotypes are defined as societal behavioral expectations placed upon a person as a result of their gender group membership (Diekman & Eagly, 2000; Eagly & Steffen, 1986).

Gender wage gap.

Gender wage gap is defined as the discrepancy in earnings between males and females based on gender (DeNavas-Walt, Proctor, & Smith, 2011; Budig, 2002; Hegewisch et al., 2012). As of 2011, women earned approximately 82% of what men earned when measuring income based upon weekly wages (Hegewisch et al., 2012).

Female-dominated occupations.

Female-dominated occupations are defined as occupations in which 75% or more of the employees in that field are female (U.S. Department of Labor, 2010).

Industry credentials/certifications.

Industry credentials and/or certifications can be earned by CTE students who pass an assessment designed to measure technical competency of skill sets used in a specific career field (NRCCTE, 2013).

Male-dominated occupations.

Male-dominated occupations are defined as occupations in which 75% or more of the employees in that field are male (U.S. Department of Labor, 2010).

Nontraditional careers.

Nontraditional careers are defined as careers or occupational fields in which 25% or less of the workers in that field are comprised predominately of one gender (U.S.

Department of Labor, 2010). A female pursuing a male-dominated occupation or a male pursuing a female-dominated occupation would qualify as a nontraditional career.

Occupational gender segregation.

When employees in a particular occupational field are comprised predominately of one gender. The generally accepted cut off is 25% or less of one gender (U.S. Department of Labor, 2010).

Perkins IV.

Perkins IV refers to the Carl D. Perkins Career and Technical Education Improvement Act of 2006. This is the primary law that governs CTE programs in the United States. In addition to encouraging students to pursue high wage, high demand occupational training, it also required programs of study and established accountability for nontraditional participation (Carl D. Perkins Career and Technical Improvement Act, 2006; Meeder, 2008).

Programs of Study.

Programs of study are defined as transitional pathways between secondary academic and CTE courses, postsecondary education, and/or industry credentials than can prepare students for skilled labor (Alfeld & Bhattacharya, 2012; Carl D. Perkins Career and Technical Education Improvement Act, 2006).

Sex.

Sex is defined as biological or physical characteristic that establishes a person as either male or female (Plhakova & Pavelkova, 2007).

CHAPTER II

LITERATURE REVIEW

This literature review is organized into five sections. In the first section, a brief overview of sex and gender is presented, followed by discussions of gender stereotypes and issues concerning gender and occupation. The fourth section gives a summary of the literature on nontraditional careers, while the final section covers the role of career and technical education, including key legislation, gender issues, and data collection.

Sex and Gender

Male and female. This basic human attribute seems so simple on the surface; however, the concept of sex, gender, and its influence on human behavior is one of the most studied and debated in all of psychology, with gender-related theories dating back to the beginnings of psychology (Morawski, 1985). It is easy to proclaim that all humans are gendered, but relating this abstraction to the concrete decisions that individuals make in their daily lives is a more difficult task. While the bulk of gender research initially focused on establishing the theoretical constructs of masculinity and femininity, later research concentrated on studying how gender differences impact people's lives (Smiler, 2004).

In order to understand the impact of gender, one must first make the distinction between gender and sex. Sex is a biological or physical characteristic that defines a person as either male or female while gender encompasses male or female behavior

(social and psychological) that a person develops as a result of socialization (Plhakova & Pavelkova, 2007). Only in the last 40 years has this differentiation arisen, based upon Money and Ehrhardt's (1972) proposal to use the term sex to classify a person based upon biology and gender to categorize behavior differences based upon sex. The labels masculinity and femininity were developed as a means to classify and explain the extent of different gendered behaviors in individuals (Udry, 1994).

Early psychology defined masculinity and femininity as two bipolar opposites, beginning with the psychological inventory published by Terman and Miles in 1936. Over the next three decades, other psychological tests were designed to calculate a single MF score, upholding the notion of masculinity and femininity as opposite ends of a polar spectrum (Smiler, 2004). Constantinople (1973) contradicted the prevailing theory of a bipolar masculinity and femininity and also posited that the gender roles were also more than just unidimensional constructs. Bem (1974) also disputed the idea of a single masculine or feminine continuum by introducing a sex-role inventory (the BSRI) that also calculated androgyny in addition to the dimensions of masculinity and femininity. Bem viewed the inflexible sex-role differentiation of the previous era as outdated and embraced the concept of androgyny as a more useful attribute. Much like Bem, Spence, Helmreich, & Stapp (1974) also viewed masculinity and femininity as nonconflicting entities, developing the Personal Attributes Questionnaire (PAQ) to assess instrumental (male) and expressive (female) traits.

As research and thought on gender evolved, psychologists began to cast doubt on single-factor models of masculinity and femininity. Edwards and Spence (1987) made a case for a multifactor structure of gender identity, concluding that gender-differentiating

qualities are not always interrelated which contradicted previous literature that masculinity and femininity were each a single factor. The basic idea behind the multifactor structural model is that within both the male and female genders, various gender-specific attitudes, actions, and beliefs cannot be assumed to be correlated and a person's position on one does not necessarily predict how they will measure on another (Spence & Hall, 1996).

Subsequent research on the factor structure of masculinity and femininity has supported Edwards and Spence's (1987) assertion of a multifactor structure of gender identity. Over the years a number of exploratory and confirmatory studies conducted on the BSRI have suggested anywhere from 2 to 11 factor structures, challenging the idea of a simple two dimensional masculine and feminine structure (Choi, Fuqua, & Newman, 2007). In a 2009 study of the BSRI-Short Form, Choi, Fuqua, and Newman found a three-factor structure of gender roles consisting of Femininity, Social Masculinity, and Personal Masculinity, replicating a previous study. Based upon these findings, Choi, Fuqua, and Newman (2008) suggested a trend toward less dichotomous characterization and a more moderate endorsement of gender roles. Choi et al. (2009) found that for one entire masculine factor—Personal Masculinity—there was no significant difference between men and women, which suggests that gender roles within our current society are becoming increasingly blurred.

Although an individual's sex is determined by biological factors and known at birth, gender is an aspect that is developed based upon biological, psychological, and sociological factors (Bussey & Bandura, 1999). Gender development is a process that begins early in life, with children establishing an awareness of gender group membership

and their differentiating behaviors by the time they are three or four years-old (Tobin et al., 2010). However, while young children display a recognition of separate gender group membership, they still remain largely unaware of social gender hierarchies. In a study of four year-olds, Halim, Ruble, & Tamis-LeMonda (2013) found that both boys and girls believed that public regard for their particular gender group was higher. For example, girls presumed that the general public considered girls to be better than boys whereas boys thought that people believed that boys were better than girls.

A key debate in gender development research is the dichotomy of nature vs. nurture, with some scholars promoting biological explanations while others point to the impact of socialization (Zosuls, Miller, Ruble, Martin, & Fabes, 2011). Tobin et al.'s (2010) Gender Self-Socialization Model (GSSM) suggested that gender development encompasses three main constructs: gender identity, gender stereotype, and attribute self-perception that work in concert to help children process gender information. Tobin et al. (2010) suggested that it is plausible that both environmental and biological factors contribute to the formation of gender identity, stereotype, and self-perception. Some specific influences hypothesized to impact these constructs include: "culture, parents, peers, and media" (environmental), and "hormones, genes, temperament, and physical attributes" (biological) (Tobin et al., 2010). According to Bussey and Bandura (1999), socialization is also crucial to gender development, with observation and imitation serving as important methods for children to learn about gender roles.

Based upon the established differences in gender behaviors and attitudes, Eagly (1997) formed a social role theory that focuses on the impact of societal expectancies on men's and women's behavior. These expectancies create gender stereotypes for social

roles that govern the behavior of men and women. Chief among these expectations is that men and women possess certain sets of characteristics, with men being more agentic (independent, assertive, and competent) and females more communal (friendly, expressive, and unselfish) (Eagly & Steffen, 1986). An important component of social role theory, however, is that gender expectations are not fixed; rather, they are based upon current social roles. As social roles change, so do the gender stereotypes that surround them (Diekman & Eagly, 2000). These stereotypes affect men and women in all aspects of life, but especially in decisions made regarding occupations.

Gender Stereotypes

Although much progress that has been made over the past few decades in understanding and promoting gender equality in society and in the workforce, gender assumptions remain ingrained in society. Despite the fact that opportunities exist for both men and women to succeed in nearly all occupations based upon their abilities and goals (Hayes, 1986), perceptions of gender-appropriate careers abound (Couch & Sigler, 2001; Evans & Diekman, 2009). Bussey and Bandura (1999) posited that since an occupation is an important part of personal identity, careers are therefore categorized along the lines of personal “gendered practices” that people learn throughout the gender socialization process that begins during early childhood. These perceptions and assumptions of careers as sex-typed may very well contribute to the continued proliferation of occupational gender segregation that is seen in the workforce today.

The literal definition of a job is “a specific duty, role, or function” (Merriam-Webster, 2013). There is no mention of gender in this definition, nor do the definitions for “occupation” or “vocation” allude to gender either; however, the majority of

professional occupations are readily classified as gender-specific based upon human perception. Using cultural stereotypes, occupations are assigned a sex-type based upon society's perception of appropriateness. These stereotypes are inculcated in young minds despite the fact that increased educational attainment has led to career opportunities being equally accessible to both men and women (Couch & Sigler, 2001).

Gender stereotypes often have an impact on the types of jobs to which people aspire. Oswald (2008) suggested that stereotype activation is one potential explanation for women pursuing traditionally feminine occupations since gender stereotypes abound in society. In an experimental study of the causal impact of gender stereotypes on female college students' reported liking of and perceived ability in traditionally masculine and feminine occupations, Oswald (2008) found that gender identification played a role in a woman's preference for feminine-typed occupations. The more strongly gender identified a female was, the more susceptible she was to stereotype threats as well. This is consistent with other findings that for women, femininity has been shown to be a positive predictor of the traditionality of one's expected job, while masculinity is a negative predictor (Weisgram et al., 2011).

Evans and Diekmann (2009) believed that differences in gender beliefs explain gender differences in goals and career interests between men and women. According to the theory of "motivated role selection," gender roles help men and women determine which goals are most important and from there they identify a career path that allows for the pursuit of these goals. It is a person's internalized gender role, rather than their sex, that determines the goal and subsequent career interest (Evans & Diekmann, 2009). While occupations are not necessarily sex-typed according to this theory, an individual is very

susceptible to stereotype threats (perception based upon societal expectations in regards to a person's group membership) that might influence their gender beliefs (Spencer, Steele, & Quinn, 1999) and subsequently, their career choices. For example, a female might forgo pursuing a career that would require long hours or considerable travel for fear of not fulfilling her societally prescribed role as a good caregiver to her family.

Stereotype threats can also impact perception of an individual's performance in a particular position or field, which may limit a person's desire to seek out certain jobs. Heilman and Okimoto (2007) found that women who are successful in male domains are often penalized socially. Women in leadership roles were more disliked and disparaged than men with similar attributes in the same roles. Heilman (2001) attributed this to the prescriptive aspect of gender roles. Just as gender stereotypes define what society expects of each gender, these same stereotypes also establish various social prohibitions on certain behaviors for males and females. This could potentially impact career choice if a person is hesitant to violate gender norms.

Gender-based preferences often manifest themselves early on in a person's life. Research suggests that children use gender-role knowledge to make judgments about themselves in terms of activity and occupational preferences as early as elementary school (Patterson, 2012). Mastekaasa & Smeby (2008) found that students who selected majors in gender traditional fields more frequently exhibited an early preference for the program they enrolled in, making the decision during their childhood or youth years.

Correll (2004) concluded that people form career aspirations based in part on self-perception of their competence at various tasks and that these beliefs can be biased if they believe that one gender has a greater advantage than the other. For example, when

subjects were told that men typically have more ability at a given task, males displayed an increased perception about their competence and thus showed a greater preference for that task. In a society where cultural beliefs and gender stereotypes remain a factor and males and females are seen as having greater predispositions for certain task abilities, the potential for creating gender-based biases in self-perception is a very real threat and could contribute to gender-segregated occupations.

Although society influences gender socialization and sex-role perceptions, some of the primary socializers on young men and women are found in their own households. Young adults do not always make independent decisions when they select their occupations; rather, parental stereotypes and expectations have been found to impact a child's decision to choose an occupation that is either gender traditional or nontraditional. Parental expectations are especially predictive of the types of careers that females pursue (Jacobs et al., 2006), while working male adults in a child's household can impact boys' aspirations, more often than not stereotyping toward male-dominated careers (Schuette et al., 2012).

Despite the impact that gender roles might have on career decisions, they are not simply a prescriptive determinant. Rather than embracing strict adherence to traditional gender roles, Clarey (1985) promoted resocialization, or developing an identity based upon the situation rather than reacting based upon one's gender role. His research indicated that gender roles could be modified through counseling treatment, allowing women to overcome stereotypical gender role attitudes. This would then theoretically open the doors to a wider variety of careers and help close the occupational gender gap. Andrews and Ridenour (2006) found similar results in regards to educating individuals

about stereotypes and increasing awareness about their prevalence. As the participants in this study became more aware of the negative effects of gender stereotypes, they began to adopt more gender fair practices and decrease the instances of stereotyping.

Newer research suggests that young women are beginning to overcome gender stereotypes, primarily as a result of increased educational attainment. Since the late 1980s, women have consistently outnumbered men in postsecondary education. In 2010, women earned the majority of postsecondary degrees at all levels (62% of associates degrees, 58% of bachelor's degrees, 60% of master's degrees, and 52% of doctoral degrees) (NCES, 2012). In recent studies of elementary and middle school students, girls exhibited a preference for careers that were less sex-typed than boys, implying that girls are expanding their career aspirations and suggesting that this might lead to a less segregated professional workforce in the future (Blackhurst & Auger, 2008; Schuette et al., 2012).

Gender and Occupation

Despite the fact that women exceed men in postsecondary enrollments and degrees earned, men still outnumber women in the labor force. Although this gap has narrowed in the last several decades, U.S. Census data show that in 2010, 71.2% of males ages 16 and up were employed versus 58.6% of females (U.S. Census Bureau, 2012). However, to many researchers, of more interest than simple participation rates is the persistence of occupational gender segregation.

In 2010, approximately 80% of the jobs classified by the U.S. Census Bureau were filled predominately by one gender (U.S. Census Bureau, 2012). While some skew might be expected due to a larger percentage of men in the labor force than women, one

concern of such segregation is that women are generally concentrated in fields that yield lower economic rewards (Cross & Bagilhole, 2002; Hogue et al., 2010; Huffman & Cohen, 2004). While there is ample data available to show that occupational segregation is still a relevant concern despite equal opportunities that males and females have for both education and career entry, the issue of why such segregation continues remains a question without a consensus answer.

In order to understand why particular occupations remain gender segregated, it is important to consider gender segregation first from an organizational perspective. Acker (1990) offered the theory of gendered organizations in which she asserted organizational structures themselves are gendered, which in turn perpetuates a cycle of gendered occupations. Gendered organizations are defined as places where “advantage and disadvantage, exploitation and control, action and emotion, meaning and identity, are patterned through and in terms of a distinction between male and female, masculine and feminine” (Acker, 1990, p. 146). According to Acker (2006), the process of delineating specific work requirements and job responsibilities lend organizations to search for the ideal worker—an individual glamorized as unencumbered by outside family obligations and solely dedicated to the organization—who is generally presumed to be a man. Budig (2002) found that while outside obligations such as marriage and family have a negative impact on female wages, the reverse is true for male wages. Budig (2002) theorized that these responsibilities are perceived as distractions for women but as commitments that increase occupational dedication for men due to social pressures on males to serve as providers. Changing the gendered nature of organizations would be extremely difficult,

Acker (1990) argued, due to the long history of systemic gender bias that has been embedded in organizational structure.

On an individual level, the theory of circumscription and compromise (Gottfredson, 1981) is one hypothesis that attempts to explain the process by which an individual selects certain occupational fields and eliminates others. According to Gottfredson (1981), circumscription is a multi-stage activity that spans the preschool years to early adulthood wherein a person develops an individual world-view based on societal influences and determines potential occupational choices. A person forms a self-concept and then begins to select or eliminate careers based upon their compatibility with one's self-view. Gender role preference and perception are crucial aspects of this theory. Gender helps form an individual's self-concept, which he/she uses to judge the desirability of various occupations and it also is the component of occupational compromise that people are least willing to sacrifice, although this sometimes leads to individuals' unnecessarily restricting their career options (Gottfredson & Lapan, 1997). Gottfredson's work provides a theoretical foundation for understanding the interplay between gender and occupational choices.

Simply knowing the sex of workers in a certain field is enough to affect the interest level of males and females in regards to working in that particular field, contributing to a cycle that allows occupational gender segregation to persist (Weisgram, Bigler, & Liben, 2010). One possible explanation for this phenomenon is that women seek out more traditionally female fields as a means to avoid gender role conflict (gender-based assumptions that run counter to an individual's self-concept) (Chusmir & Koberg, 1988). Luhaorg & Zivian (1995) found that a high femininity score on the Bem Sex Role

Inventory predicted an increased gender role conflict for more male-dominated occupations. In a study on female policewomen, Krimmel and Gormley (2003) noted a positive relationship between the proportion of women in a department and job satisfaction. These findings align with Bem's sex role theory, which suggests that individuals who score higher on either the M or F indexes are less flexible and therefore have greater tendencies to experience conflict in situations that are atypical of their gender role (Bem, 1974).

It has been strongly suggested that gender role plays a causal role in determining an individual's occupational interests (Weisgram et al., 2010). Research has shown that males show a greater interest in masculine jobs and females show a greater interest in feminine jobs. Marini, Fan, Finley, and Beutel (1996) found that gender was the number one influence on occupational values, explaining more variance than background characteristics such as race, parental education, mother's employment, community of origin, or religion. Since women and men attach different levels of importance to various job attributes, they are often drawn to different jobs, which segments the occupational market.

In general, people associate higher status occupations with masculinity. Research speculates that this helps contribute to occupational sex segregation because while males are predominately status-driven, females tend to focus more on the gender role of the occupation. Across age groups, females have been shown to prefer female-oriented professions more than boys prefer male-dominated ones (Teig & Susskind, 2008). While males seem to seek out status, primarily money and power (Weisgram et al., 2010; Weisgram et al., 2011), regardless of an occupation's gender role orientation, females

eschew status in favor of a female-dominated area. Males, on the other hand, are not as focused on avoiding feminine-typed behaviors and characteristics in terms of activities or occupations (Patterson, 2012).

It is important to note, however, that while gender is a predictor of pursuing traditional occupations, what a person values in a job is also an important predictor of the type of job that they aspire to attain. Weisgram et al. (2011) noted that when gender barriers get crossed for occupational selection, it is often a result of a man or woman holding values that are nontraditional for their gender (such as a man valuing family time or a woman valuing high salary). This shifts the causal argument of occupational sex segregation away from gender, instead positioning it in the values arena. In one occupational gender perception study, participants consistently rated professions that they associated with control or power as “masculine” and jobs that had caregiving attributes as “feminine” (Couch & Sigler, 2001). Evans and Diekmann (2009) reported similar findings among undergraduate students, with males anticipating status goals to be most important to them in their future careers while women anticipated that caregiving goals would be more important. While these values might influence a person’s career path, they do not necessarily predict an avoidance of opposite gender careers (Evans & Diekmann, 2009). However, an individual’s values can be highly influential in impacting occupational decisions. Even highly educated females who plan on obtaining advanced degrees report expecting to make tradeoffs in regards to achieving a work/home balance, willingly jeopardizing their career success in order to achieve their goals as a mother (Feteroff & Eagly, 2011).

Linking an individual's values to occupational aspirations is one way that researchers have explained the discrepancy between the increased educational attainment of women with the continued gender gap and segregation in employment. While some might surmise that more women earning advanced degrees will eventually lead to a tipping point that balances out the workforce, Hakim (2006) predicted that the polarization of the labor market will persist or even increase based upon women's gender role preferences. "Preference theory" suggested that men will continue to dominate employment fields because relatively few women are willing to prioritize their careers over other options as men often do. While the majority of men are work-centered, work-centered women remain in the minority. Instead, most women seek a work-life balance and therefore gravitate toward certain female-dominated occupations (such as teaching) that allow them to balance their work lives and home lives (Hakim, 2006).

Under preference theory, occupational segregation is positioned more as a result of choice than as a lack of access to sex-typed jobs. While decades ago it could be argued that gender stereotypes restricted women's access to certain career fields, such is no longer the case, primarily as a result of increased educational access and attainment by women. Hakim's (2006) theory argued that many 21st century women elect to forgo careers in high status, high wage fields not because they feel uncomfortable, but because they choose to be adaptive and prioritize other aspects of life in addition to work. Current data suggest that there is merit to this assertion. Still (2006) suggested that the "opt-out revolution," in which educated women willingly leave the workforce upon having children, is a real phenomenon, brought about in part by inflexible work

environments and policies. However, opting-out appears to be a trend restricted to a smaller, more affluent segment of the population (Still, 2006).

Gender segregation in employment is not limited to work that is performed outside of the home. In dual-earner homes, achieving a work/home balance and an equitable division of labor can be just as problematic as striking a gender balance in the workforce. Milkie, Raley, & Bianchi (2009) examined the “second shift” phenomenon popularized by Hochschild (1989), which asserted that employed mothers faced hours of unpaid domestic labor upon arriving home from their paid jobs. Although the discrepancy between males’ and females’ domestic workloads was not as pronounced as Hochschild (1989) suggested, Milkie et al. (2009) found that it does exist. Hall & MacDermid’s (2009) research supported this finding as well. They reported that in dual-earner households, where both males and females work comparable hours, the at-home division of labor remained disproportionate, with women taking the greater responsibility for domestic chores and childcare. Halim et al. (2013) discovered that young girls who lived in households where their mothers performed most of the domestic chores were highly likely to believe that the public perceived boys as being better than girls. They deduced that this potentially contributes to a gender bias toward future occupational pathways. Milkie et al. (2009) hypothesized that the excess burdens that females face in their attempts to “do it all” might lead to a reduction in work hours. Additionally, Budig (2002) reported that an unequal division of labor at home rewards men while penalizing women. Men remain unburdened and are free to pursue the breadwinner role while employers perceive women with domestic obligations as less than ideal employees due to their extra obligations (Budig, 2002). Still (2006) suggested that the tension and anxiety

of trying to fulfill roles as both an employee and a mother lead women to either opt-out completely or to value jobs that allow for greater caregiving flexibility, which helps to contribute to the continuation of gender inequality in the workforce.

Occupational gender segregation is more than just social justice issue; rather, it also produces ancillary effects such as the gender wage gap. Historically, men have always out-earned women and their salaries continue to outpace women's pay regardless of race or ethnicity (DeNavas-Walt et al., 2011). Males also out-earn women regardless of whether or not the occupational field is male-dominated, female-dominated, or gender neutral (Budig, 2002). Despite closing the gender wage gap to an all-time low in 2011, women still earn just 82.2% of what men earn, based upon weekly wages (Hegewisch et al., 2012). Although these gains are considered encouraging in terms of reaching occupational gender wage parity, Hayes (2011) predicted that it will still take almost another half-century before women's earnings are on par with men's. Explanations for the continued disparity in pay include a greater concentration of women working in lower paying fields (Marlene, 2013), differences in employee pay expectations based upon gender, employer assumptions that they have to pay men more, and the reluctance of women to negotiate for higher pay (Bowles & Babcock, 2012).

Recent federal legislation has attempted to remedy the persistence of the gender wage gap. The Lily Ledbetter Fair Pay Act addresses sex-based wage discrimination and extends the statute of limitations for pursuing claims, allowing individuals to pursue subsequent compensation claims (Lily Ledbetter Fair Pay Act, 2009). The passage of this law was predominately motivated by the Supreme Court's decision in *Ledbetter v. Goodyear Tire and Rubber Co.*, in which a female supervisor learned that she was paid

significantly less than three male supervisory colleagues. The court ruled in favor of the employer and its decision was criticized as encouraging and even incentivizing wage discrimination (NWLC, 2013). Pairing this type of legislation with strategies such as enforcing existing equal opportunity laws, increasing family friendly policies for women in high wage fields, and increasing pay in female-dominated fields has been suggested as a means to close the gender wage gap (Marlene, 2013).

When discussing the gender wage gap, wage structure also warrants consideration. Wage structure is defined as “the market returns to skills and the rewards for employment in particular sectors of the economy” (Blau & Khan, 2007). In essence, the argument is that experience and tenure play a role in how much a person earns. As a result, the gender wage gap is actually at its narrowest for younger workers (workers with the least job tenure) but widens sharply as women age (Hallman, 2013). This increase is often attributed to women’s greater likelihood of leaving and reentering the workforce while men have greater workforce continuity, thus resulting in increased occupational tenure. This creates a situation where men have greater workforce experience and are able to command a higher salary (return on experience) whereas women command a lower salary based upon their lesser experience under the wage structure theory (Blau & Khan, 2000).

The calculation of the gender wage gap also merits exploration. According to Blau & Khan (2007), the best way to measure wage discrepancies is to compare the hourly rate of pay for men and women since this would allow for an even comparison of both full-time and part-time workers. It also allows for a more fair comparison of wages than annual or weekly earnings since men tend to work more weeks per year and hours

per week than women (Blau & Khan, 2000). However, weekly and/or annual wages are often used to estimate the gender wage gap in the absence of hourly data. The Bureau of Labor Statistics calculates the gender wage gap for weekly earnings using the Current Population Survey. Weekly wages are based on the yearly average of median weekly earnings for the previous year. The Bureau of Labor Statistics calculates annual earnings from the Current Population Survey Annual Social and Economic Supplement data (Hallman, 2013).

Although there is no unanimity among scholars as to why occupational gender segregation persists, what is not in dispute is the fact that there are real discrepancies in the balance of gender and career pursuits. Gender does play a role in career decisions and declines in segregation have leveled off since the start of the 21st century. If a gender balance in the workforce is ever to be achieved, it is imperative to understand both how gender impacts career selection, and how certain individuals are less impacted by this influence than others.

Nontraditional Careers

It is well established that men are more likely to pursue traditional, male-dominated occupations and females are more likely to pursue traditional, female-dominated occupations (Marini et al., 1996; Weisgram et al., 2010). However, not all males and females pursue stereotypic sex-typed jobs, instead opting for employment in nontraditional careers, typically defined as a career in which 25% of the workers are predominately one gender (U.S. Department of Labor, 2010). For some it is a matter of supply and demand (an increase of women pursuing male-traditional jobs results in fewer available jobs for men and creates vacancies in female-dominated fields) (Hayes, 1989)

while for others it is a matter of a lessened adherence to traditional gender roles (Jome & Tokar, 1998).

When it comes to selecting a nontraditional occupation, women often face less societal constraints than men in choosing a gender nontraditional career. The original occupational equality movement focused on balancing the labor force by encouraging women to pursue male-typed jobs as a means to achieve greater monetary and psychological rewards (Hayes, 1986). Wilbourn & Kee (2010) hypothesized that efforts to encourage girls to aspire to high status, traditionally male occupations have resulted in sending the unintended message that traditionally female occupations are lower status and therefore less desirable to all. This has possibly sent an unintended message to boys that traditionally female careers are a downgrade, further reducing their appeal and making it less acceptable for males to pursue such fields. However, the experience of men working in nontraditional careers today seems to be different than that of men in previous decades, notably in regards to job satisfaction (Dodson & Borders, 2006).

When it comes to male job satisfaction in nontraditional work, climate seems to play an important role. Sobriaj, Korek, Weseler, & Mohr (2011) discovered that male job satisfaction in nontraditional jobs was inversely related to social stressors such as interpersonal conflicts resulting from female attitudes toward men in nontraditional careers that occur in their work environments. Wharton and Baron (1987) found that men had greater levels of job satisfaction in female-dominated workplaces over mixed-gender settings, which they attributed to a man's likelihood to receive better treatment due to the superior social position that is ascribed to their maleness. However, while studying job satisfaction in male flight attendants, Young and James (2001) ascertained

that males derived less satisfaction from their work than their female peers, partly as a result of role ambiguity, lack of job fit, and decreased levels of self-esteem.

This aligns with Kanter's (1977) theory of tokenism, which asserted that members of small subgroups within a workplace are more likely to have unfavorable experiences that result from perceived group differences between their small subgroup and the majority group. Kanter's theory is based upon a numeric ratio (less than 15% of the majority) and can be applied to both males and females in nontraditional work environments (Stichman, Hassell, & Archbold, 2010). However, although tokenism originated as a gender-neutral concept, Zimmer (1988) argued that this theory was an insufficient explanation for gender-based issues (such as job satisfaction) since it did not take into account how "organizational structures and the interactions that take place within them are imbedded in a much broader system of structural and cultural inequality between the sexes" (p.72). Williams' (1992) findings supported the contention that numerical ratios associated with tokenism do not fully account for differences in job satisfaction for male and female employees in nontraditional fields. Williams (1992) asserted that males do not shed their "gender privilege" (p.263) upon accepting employment in a female-dominated occupation; rather, they maintain a social advantage that often leads to an expedited path of career advancement.

Barriers to Nontraditional Employment

There is some evidence to suggest that the bias toward male-typed careers that Wilbourn & Kee (2010) mentioned is real, especially in terms of anticipated economic returns. Male-typed jobs have the perception of offering greater economic benefits than female-typed jobs (Hogue et al., 2010). Hogue et al. (2010) found significant differences

in the pay expectations between students who aspired to attain a female-typed job versus a male-typed job. Overall, males and females who intended to hold a female-typed job expected entry-level pay that was 18% less and peak-career pay that was 29% less than individuals who aspired to hold a male-typed job. Additionally, women who planned to hold male-typed jobs had higher pay expectations than women who aspired to hold female-typed jobs, suggesting that women believe that choosing a nontraditional career offers a pay advantage.

Aside from the economic inequalities, another barrier to nontraditional employment is the issue of social stigma. It is much more socially acceptable for a female to pursue a nontraditional career than a male (Lease, 2003; Wilbourn & Kee, 2010). Men who pursue gender nontraditional careers often contend with questions about their masculinity, abilities, and even their sexuality (Hayes, 1986; Chusmir, 1990). Negative perceptions about men who pursue careers in female-dominated occupations are common and can include ridicule and prejudice (Chusmir, 1990). As a result of this stigma, males in nontraditional occupations can experience role strain, in which they experience conflict between the need to preserve their masculine identity with the feminine demands of their nontraditional job (Simpson, 2005). According to Simpson (2005), this can lead to embarrassment, discomfort, and shame among men who feel as though they have not lived up to the masculine expectations of others.

Although society more readily accepts females who pursue nontraditional careers and at times even encourages this pursuit, women still face their fair share of barriers as well. Biased career counseling, sex discrimination in course enrollment, and sexual harassment are a few of the issues that women face when they aspire to a career in a

traditionally male field (Eardley & Manvell, 2006). Sometimes, even the perception that a woman is being discriminated against because of her sex or the anticipation of discrimination in the future is enough to influence her to drop the desire to pursue a nontraditional field (Steele, James, & Barnett, 2002). Gender stereotypes that suggest that men are more capable in certain fields such as math, science, and engineering also create hurdles for women who aspire to attain these types of careers. Steele et al. (2002) revealed that undergraduate women in these fields are most likely to report feeling threatened by gender stereotypes and subsequently consider changing their majors at higher rates than other students, perpetuating the cycle of underrepresentation of women in these fields.

Motivations for Pursuing Nontraditional Employment

While some social stigma and barriers do exist, there are certain instances (such as economic downturns or recessions) where pursuing nontraditional labor becomes more of a necessity than a choice. Today's labor market is increasingly competitive and with many female-dominated careers experiencing staffing shortages, men might consider entering a nontraditional field for the purpose of obtaining employment (Dodson & Borders, 2006). The U.S. Bureau of Labor Statistics (2012) anticipates that between 2010-2020, the service industry (which has traditionally been comprised of mostly female-dominated occupations) will be the sector that experiences the most job growth, with up to 18 million new jobs projected. In addition to expanded availabilities, nontraditional careers offer men the opportunity for self-fulfillment, a greater chance of upward mobility, and the ability to regularly interact with members of the opposite sex (Hayes, 1986). Nontraditional careers offer women the opportunity for higher status and

prestige (Teig & Susskind, 2008; Wilbourn & Kee, 2010) and greater pay (Hogue et al., 2010).

Men and women who pursue gender atypical careers often display different motivations for their willingness to go against societal stereotypes. Men who choose nontraditional careers tend to have lower status needs, instead valuing other job-related aspects such as a collegial atmosphere, social opportunities, and/or altruism (Lease, 2003). Women who pursue male-dominated careers are more likely to have a higher interest in math and science than other females, less likely to have parents that model traditional gender stereotypes (Bona, Kelly, & Jung, 2010), and tend to have higher levels of self-efficacy and assertiveness than other females (Nevill & Schlecker, 1988).

Increasing Nontraditional Employment

In terms of encouraging nontraditional occupational pursuits, an oft-cited suggestion is a greater emphasis on career counseling. School counseling can be especially helpful for young people in terms of increasing their awareness of career options and understanding how their interests and abilities relate to various occupational requirements (Blackhurst & Auger, 2008). However, Gottfredson & Lapan (1997) pointed out that despite the fact that people form a gender-self concept that will eventually influence their vocational aspirations as young as age six, students do not typically start to receive career counseling until their teen years. By this point in time, young adults might have already limited their career options based upon gender stereotypes during the circumscription process, potentially derailing them from considering legitimate nontraditional careers in which they could be successful.

Although career counseling is seen as a way to help individuals find a career choice that matches their interests, skills, and abilities, counselors are susceptible to the negative stereotypes that surround nontraditional work and are encouraged to be aware of their own potential biases (Lease, 2003). Chusmir (1990) cautioned career counselors not to discourage nontraditional careers based upon faulty anecdotal evidence, but instead to consider a combination of an individual's personality, family, and social influences when helping a person decide upon a field of employment. Lease (2003) suggested that counselors help individuals form partnerships with those working in nontraditional fields in order to provide proper role models and mentors.

Although masculine occupations have always represented the top tier in prestige occupations, research and history has shown that as women enter these fields (such as medicine and law), they eventually become gender neutral (Teig & Susskind, 2008). With more high status jobs becoming increasingly gender neutral, Teig and Susskind (2008) posited that career focuses might soon shift from the gender of the job to the nature of the work. When this tipping point occurs, more careers would be considered gender neutral rather than nontraditional. Individuals might then be free to focus on what they want to be rather than be constrained by society's determination of appropriateness (Wilbourn & Kee, 2010). In order to facilitate such a shift in occupational gender paradigms, earlier career preparedness programs that expose students to a variety of occupational options might be the answer (Blackhurst & Auger, 2008). An existing avenue to accomplish such a goal might be high school career and technical education programs (CTE), given its prevalence and high participation rate among American high school students (NCES, 2003).

Career and Technical Education

Career and Technical Education (CTE) is an organized educational program that prepares students for a particular career. These careers typically require some form of technical competency other than or in addition to a traditional high school or college degree. The goal of CTE is to empower students with occupational-specific skills that will be necessary for them to achieve economic independence and be a productive member of society (U.S. Department of Education, 2009). Traditionally, CTE is grouped into eight major categories: agriculture technology, business and marketing, communication technology, construction technology, health and human services, public safety and security, manufacturing technology, and transportation technology. Various programs of study are offered within each of these areas depending on the state (Kentucky Tech Office of Career and Technical Education Department for Workforce Investment, 2009).

CTE History and Legislation

Career and Technical Education, formerly known as vocational education, has been in existence for hundreds of years in America. The roots of vocational education can be traced back many centuries, beginning historically with colonial apprenticeship programs and evolving over time into trade schools due to industrialization and labor needs. Trade programs that employed a father-son apprenticeship model actually preceded the system of free public education championed by the likes of Ben Franklin (Barlow, 1976).

Primarily in response to a need for skilled labor in the United States, the federal government inserted itself into the emerging vocational education field. The Smith-

Hughes National Vocational Education Act was passed by Congress in 1917 and provided federal funds for the promotion of vocational education in agriculture, home economics, and trade/industrial arts fields. While the Smith-Hughes Act was instrumental in promoting vocational education, it was also responsible for its isolation from traditional academic schools (Hayward & Benson, 1993). For over 40 years the Smith Hughes Act was the predominant piece of vocational legislation but recognizing the need for improvement in the face of changing workforce needs, the federal government passed the Vocational Education Act of 1963 (Wheeler, 1981). This policy also focused on the social services aspect of education, recognizing students with special disabilities or economic disadvantages have needs in vocational education programs as well (Rojewski, 2002).

Although not limited to just CTE, Title IX of the Educational Amendments of 1972 also had a significant impact on vocational education by prohibiting sex discrimination in education. According to this piece of legislation:

No person in the United States shall, on the basis of sex, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance” (Title IX of the Educational Amendments of 1972, 20 USC Section 1681).

The U.S. Department of Education has interpreted Title IX as also prohibiting disproportionate course enrollment between males and females on the basis of gender discrimination (Eardley & Manvell, 2006). Before the passage of this law, CTE programs and courses were commonly segregated based upon the gender appropriateness of courses and career fields. Title IX made such segregation illegal (Lufkin et al., 2007).

Of all the policy mandates, the one with the most recent and continuing impact is the Carl D. Perkins Vocational Education Act, which was first passed in 1984 and later reauthorized in 1998 and 2006 (U.S. Department of Education, 2009). The Perkins Act represents a sort of full-circle evolution of the laws on vocational education, as it continues to provide funding and make vocational education programs accessible while at the same time placing emphasis on reconnecting traditional academics to vocational education programs (Lynch, 2000). Among the changes, the law replaced the term “vocational education” with “career and technical education” and included new requirements for programs of study that link academic and technical content, ushering in the current era of CTE in American schools.

The original Carl D. Perkins Vocational Education Act centered on two goals: meeting the needs of the nation’s workforce by modernizing vocational education programs and ensuring that everyone, regardless of status, disadvantage, or disability, had access to quality vocational education programs (Hayward & Benson, 1993). Perkins II (the 1990 reauthorization) focused primarily on bridging the gap between academic and vocational programs by integrating academic and technical curricula and required greater state accountability in the form of performance measures and standards.

The third reauthorization of the law, Perkins III (1998), was intended to position career technical education into the broader educational reform conversation, placing an even greater focus on curriculum integration, parent and employer involvement, secondary and post-secondary partnerships, technology usage, and professional development for teachers of CTE. Additionally, accountability measures were increased, and states were required to evaluate performance on four indicators: student achievement,

acquiring credentials, transitioning to employment, post-secondary institutions, or the military, and nontraditional training and employment. (Stone & Aliaga, 2003). In terms of nontraditional students, Perkins III specifically required that states and local districts collect and report data on student participation and completion of nontraditional CTE programs and to disaggregate the data by gender, race/ethnicity, and other special populations (NAPE, 2006).

The most recent iteration of the law governing CTE programs, the Carl D. Perkins Career and Technical Education Improvement Act of 2006, made several key changes to the previous legislation: requiring programs of study, expanding state and local accountability, and preparing students for economic and personal competitiveness. These changes were made to ensure that students are encouraged to pursue career options that are high-wage or in high-demand and that they take the appropriate courses necessary to achieve these goals (Meeder, 2008). Perkins IV specifically defined successful student outcomes as “student placement in postsecondary education or advanced training, in military service, or in employment” (Section 250-15).

In order for students to meet the outcome goals, Perkins IV established programs of study that were intended to assist students in successful transitioning from high school CTE to college or the workforce. Programs of study fuse traditional academics with dual enrollment course opportunities in order to help students earn industry-recognized certifications or credentials through specified sequences of courses (Alfeld & Bhattacharya, 2012). Although officially defined in Perkins IV, the roots of programs of study can be traced back to various legislation over the past 40 years that emphasized creating intentional linkages between students’ secondary knowledge and skill

acquisition and future career outcomes (Stipanovic, Lewis, & Stringfield, 2012).

According to Perkins IV, programs of study are designed to:

- (i) incorporate secondary education and postsecondary education elements; (ii) include coherent and rigorous content aligned with challenging academic standards and relevant career and technical content in a coordinated, non- duplicative progression of courses that align secondary education with postsecondary education to adequately prepare students to succeed in postsecondary education; (iii) may include the opportunity for secondary education students to participate in dual or concurrent enrollment programs or other ways to acquire postsecondary education credits; and (iv) lead to an industry-recognized credential or certificate at the postsecondary level, or an associate or baccalaureate degree (Section 122, c.1).

Perkins IV also required that states and local districts not only collect data on nontraditional participation, but also use this data to develop improvement plans (NAPE, 2006). In essence, the intent of the law is to make states and districts aware of imbalances in participation and to formulate plans to address those gender gaps in order to bring more equality to the overall technical education provided to students. Perkins IV explicitly defines nontraditional fields of study as:

Occupations or fields of work, including careers in computer science, technology, and other current and emerging high skill occupations, for which individuals from one gender comprise less than 25 percent of the individuals employed in each such occupation or field of work. (Carl D. Perkins Career and Technical Education Improvement Act, 2006, p. 6).

Individual states are tasked with determining which CTE programs to offer overall and then must cross reference these programs with national employment statistics in order to define which programs meet the nontraditional criteria. States originally developed a benchmark for nontraditional participation after the 1998 version of the law was enacted and they identify yearly performances measures based upon this benchmark (NAPE, 2006). Although the ideal scenario would involve a gender enrollment that is representative of each school's gender balance, the minimum recommendation set forth by the National Alliance for Partnerships in Equity's 2006 *Guide for Program Improvement for Perkins IV* is an 80/20 balance, in which no course or program should be comprised of more than 80% of one gender.

CTE and Gender Equity

Despite the lofty and well-intentioned goals of recent CTE legislation, especially in relation to accessibility and accountability for all students, CTE programs often fall short in terms of promoting gender equity and mirror the issues of occupational segregation seen in the labor market at large (Lufkin et al., 2007). The lack of gender equity can partially be blamed on CTE's origin as a patriarchal apprentice-style system (Barlow, 1976) and partially on social roles and the lack of early legislation addressing sex segregation of educational programs. Prior to the passage of Title IX in 1972, CTE programs were intentionally segregated by sex and schools were within their rights to ban males and females from training programs deemed inappropriate for their respective sex (Lufkin et al., 2007). The prolonged acceptance of such bias helped to systematically sort women especially into low-skill, low-wage stereotypical feminine occupations. The

pattern of sex bias and gender stereotyping continues to this day, depriving women and some men of the full benefits of CTE preparation (Eardley & Manvell, 2006).

It is well established that CTE has not been successful in eliminating gender bias or gender stereotyping (Sayman, 2007). In fact, the increased accountability and reporting required over the past decade has only served to demonstrate that there has been no significant improvement in nontraditional participation, especially among females, in the last 10 years (Eardley & Manvell, 2006). A 2005 study by the National Women's Law Center found that sex segregation is still pervasive based upon an analysis of high school CTE enrollment from 12 states. Females were overrepresented in courses in traditionally female fields (cosmetology 98%, childcare 87%, health professions 86%) and underrepresented in traditional male courses (agriculture 25%, engineering 16%, construction 10%, automotive 9%). The issue with such skewed enrollment is that females are subsequently limited in their access to nontraditional fields, which typically pay more (NWLC, 2005).

Research on the effectiveness of CTE participation on labor market outcomes suggests that males and females experience different postsecondary benefits. Kemple (2008) conducted a longitudinal study utilizing random assignment on the long-term impact of career academies. (Career academies combine academic and technical instruction with workforce preparation.) During an eight-year follow up, the author noted that male participants experienced positive labor market outcomes, out earning nonparticipants by over \$30,000 during the eight-year post-graduation period. However, no significant labor market outcome was found for female participants. Kemple (2008)

attributed this discrepancy to inequalities on employment patterns, since males in the study worked more months and hours during the eight years after high school.

Eardley and Manvell (2006) examined the enrollment patterns of CTE students from 12 different states based upon gender and assessed the potential implications that coursetaking might have on the students' projected future earnings should they persist in that field. The authors compared course classification of instructional programs (CIP) codes with occupational data from the Bureau of Labor Statistics in order to ascertain the median wage for the various occupational fields under investigation. The authors found minimal nontraditional participation for either girls or boys. Girls were overwhelmingly clustered in traditionally female fields and boys were predominately enrolled in traditionally male courses. Eardley and Manvell reported wage disparities in order to underscore the imbalance in potential earnings along gender lines. Male-dominated fields in the study led to an average annual salary of \$36,790 for boys while female-dominated fields led to an average annual salary of \$27,731 for girls. These findings align with other studies that suggest male CTE students experience greater labor market benefits.

The findings from other studies examining CTE and gender equity are similar. Using the nationally representative 1988 National Educational Longitudinal Study dataset, Ainsworth & Roscigno (2005) found that females were less likely to enroll in agriculture or blue-collar vocational courses but were more likely to take courses in low-wage service areas. Based upon these findings, the authors conclude that there appears to be a sorting mechanism that distributes females into low wage tracks. Compton, et al. (2010) reported similar results in an analysis of Iowa community college completers,

finding that women generally receive lower wages than men across many programs and career areas. In the Compton et al. (2010) study, all male groups had higher earnings and greater wage increases than all female groups, regardless of completion status. Being female resulted in a negative association with 2007 wages for the three program areas studied: business, IT, and marketing. For all careers studied, women earned significantly less than men five years after leaving college, despite the fact that women had higher degree completion rates. Kemple (2008) also found a wage discrepancy between male and female CTE completers, with males earning a higher hourly wage in the eight years following high school. Although nontraditional careers are seen as one of the most favorable ways for a woman to earn a living wage, gender stereotypes and barriers that exist within CTE often keep them from realizing this goal (Sayman, 2007).

However, the sex-typing of courses is not an issue entirely unique to CTE. Traditional academic domains face the same gender equity challenges, especially in areas such as science, technology, engineering, and math (STEM) (Ma, 2011). Despite women earning a greater percentage of bachelor's degrees than men, men continue to outpace women in fields such as engineering, computer science, and physics, earning 82%, 82%, and 81% of degrees in those disciplines (NSB, 2012). Although women account for nearly half of the workforce in the United States, they comprise less than a quarter of the workers in STEM fields (Beede et al., 2011).

Coursetaking at earlier levels of education appears to play a role in future fields of study or occupational areas. Research suggests that secondary school coursework plays an important role in postsecondary degree attainment (Adelman, 2006). Ma (2011) found a positive association between math and science coursetaking in high school and earning

a STEM degree in college and suggests that encouraging students to take gender nontraditional courses in high school is one potential way to increase nontraditional degree attainment in college. However, in an experiment on course selection for their children, Tenenbaum (2009) found that parents made gender stereotyped course choices, not encouraging students to take gender nontraditional courses. This has the potential impact of restricting a child's future educational and employment options (Tenenbaum, 2009).

Coursetaking is especially important for CTE students, since course selection can lead directly to industry certifications, which give students important credentials they need in order to obtain employment in specific occupational fields (NRCCTE, 2013). Perkins IV specifically addressed coursetaking in its descriptions of programs of study. Programs of study essentially serve as pathways between high school CTE courses and post-secondary education and/or industry-specific credentials that can lead to skilled employment (Carl D. Perkins Career and Technical Education Improvement Act, 2006). The presumption is that a student who earns credentials and certifications in conjunction with a high school diploma will be more favorably positioned to have a successful postsecondary outcome, though Stipanovic et al. (2002) noted that little empirical evidence exists to measure the effectiveness of programs of study.

Prior to the programs of study mandate set forth in Perkins IV, Kerckhoff and Bell (1998) examined the impact of vocational credentials on student outcomes. The authors compared the outcomes of individuals who earned a credential or certification with those who had a high school diploma, some college, or an associate's degree. They concluded that vocational credentials had a positive impact on student outcomes.

Although subjects with credentials tended to be employed in lower status jobs, their earnings were commensurate with the earnings of individuals with associate's degrees. Adelman (2005) reported similar results in regards to credentials offering economic benefits to CTE students. Bills & Wacker (2003) attributed this to the belief that vocational credentials indicate both technical skill and productive capacity to a potential employer. Additionally, Kerckhoff and Bell (1998) found that women with a vocational credential experienced greater benefits than men, suggesting that a vocational credential can lead to a meaningful outcome in both job status and earning power for females. However, the authors characterized the current credential system as inconsistent and concluded some form of national standardization of credentials is needed in order to evaluate the true impact of vocational credentials on workforce outcomes.

In essence, the CTE courses that students take in high school are designed to have a direct impact on their future educational or occupational decisions, either through continued study in college or via attainment of industry certifications or credentials. This integration of high school courses with postsecondary and career options is commonly referred to as a career pathway, where the end goal is to prepare students for a career that provides a sustainable wage (Lekes et al., 2007). Although the intended purpose of a pathway is to educate students in a particular field and then seamlessly transition them to college or a career, gender segregation in CTE courses can also have an unintended effect of limiting access to certain career paths. In such a case, the persistence of gender-segregated programs and courses can serve as a pipeline to gender segregated occupations or fields of study.

In response to the continued gender segregation that exists within CTE programs, many have offered solutions to improve upon the nontraditional participation rate. Lufkin et al., (2007) suggested promoting equity from an institutional level (counseling services, curriculum materials), involving parents, providing nontraditional mentors, and conducting pre-technical training programs and targeted recruitment as a means to improve the nontraditional participation rate. Like Gottfredson & Lapan (1997), Lufkin et al. (2007) speculated that programs aimed at encouraging nontraditional participation should begin sooner as currently they do not start until late adolescence, long after gender role socialization has already taken place. By adolescence, boys and girls have already internalized their gender identities and the various stereotypes associated with their membership in a particular gender group (Tobin et al., 2010), which makes them less likely to consider a nontraditional career (Lufkin et al., 2007). Based on a study focusing on male nursing students, Smith (2006) suggested steps such as modifying course assignments or using learning materials that reference other men in the profession in order to recruit and retain men in nontraditional fields. Sayman (2007) cited teacher education as a primary avenue for bringing about change, suggesting that modifications are needed in educational practice, curriculum, and expectations in order to inspire a more balanced view of masculinity and femininity and to promote student openness to nontraditional careers.

CTE Data Collection

Core Indicators.

In terms of assessing CTE participation outcomes of secondary students, a wealth of data exists, largely due to the data collection requirement imposed on states by the

Perkins IV legislation. While it is left up to each state as to how to collect and maintain data, data collection of certain variables is required by this federal legislation.

Specifically, Perkins IV requires states to collect data on eight core indicators: Academic Attainment in Reading/Language Arts, Academic Attainment in Mathematics, Technical Skill Attainment, Secondary School Completion, Student Graduation Rate, Secondary Placement, Nontraditional Participation, and Nontraditional Completion (Perkins Collaborative Resource Network, 2013).

Since a primary aim of the Perkins laws was to emphasize both academic and technical performance of CTE students (Lynch, 2000), the academic attainment indicators were required in order to ensure that CTE students meet challenging academic and achievement standards in addition to their technical goals (Carl D. Perkins Career and Technical Education Improvement Act, 2006). Both academic attainment indicators are calculated by taking the number of CTE preparatory high school seniors (those who have taken at least three CTE courses in an individual program) who met the state level of proficiency for either Reading or Math and dividing this number by the total amount of preparatory CTE seniors that took the state test (Kentucky Office of Career and Technical Education, 2006).

The technical skill attainment indicator requires data collection on items such as student achievement on technical assessments or exams that are aligned with industry standards for each particular program (Carl D. Perkins Career and Technical Education Improvement Act, 2006). These are commonly referenced as either “industry credentials” or “industry certifications” and are used to help students find skilled employment (NRCCTE, 2013). This indicator is calculated by dividing the number of

CTE concentrators who passed skill assessments by the total number who attempted the assessments. Perkins IV recognized that not all programs have industry-based exams and in these instances states typically develop their own assessment to gauge student proficiency in a technical area (Justensen, 2007).

Both the secondary school completion and student graduation rate indicators measure similar attributes. While the student graduation rate is simply the percentage of CTE concentrators who were included in a state's graduation rate, secondary school completion is far more inclusive, counting the number of CTE concentrators who earned a high school diploma, GED, or other equivalent certificates as recognized by various states (including alternative degree plans for students with disabilities) (Justensen, 2007).

The secondary placement indicator is an outcome measure that assesses where a CTE concentrator matriculates to upon high school and CTE program completion. This indicator is calculated by adding the number of students who were enrolled in post-secondary study or some form of advanced training, who enlisted in the military, or who were employed and dividing this sum by the total number of concentrators who had been enrolled in secondary education during that year. Placement status data are typically gathered between October 1st and December 31st following a student's graduation (Justensen, 2007).

The final indicators, nontraditional participation and nontraditional completion, calculate CTE participants and concentrators from underrepresented gender groups in certain program areas and divide this total by the overall number of students who were enrolled in or completed the same program (Justensen, 2007). According to the Carl D. Perkins Career and Technical Education Improvement Act of 2006, an underrepresented

gender group is when less than 25% of individuals in a certain occupation are comprised of that gender. The nontraditional indicators were purposely required in order to hold states accountable to a key purpose of Perkins IV, which is to expose students to “high skill, high wage occupations and non-traditional fields” (p. 43).

Of these eight indicators, two (nontraditional participation and nontraditional completion) are distinctly concerned with gender composition of programs and courses. In addition, states also collect data on certifications earned (skill attainment) and placement (transition to college, career, and/or the military), which are directly linked to program area participation and could possibly have indirect links to nontraditional participation and completion, introducing potential gender equity implications.

Disaggregated Data Requirements and Reporting Procedures.

In addition to the core indicators for all students, federal law also requires states to collect and report data for specific disaggregated groups. These groups include: Gender, Race and Ethnicity, Individuals with Disabilities, Economically Disadvantaged (including Foster Children), Single Parents, Displaced Homemakers, Individuals with Limited English Proficiency, and Migrant Students (Perkins Collaborative Resource Network, 2013).

By December 31st of each year, states submit a required consolidated annual report that includes a narrative, accountability data, and financial status reports. Each state also submits a Final Agreed-Upon Performance Levels (FAUPL) that outlines the state’s and federal Department of Education’s agreement on performance definitions, measurement approaches, and performance targets (Schoelkopf, 2011).

Summary of the Literature

This literature review presented studies on the topics of gender, gender stereotypes, gender and occupation, and gender in career and technical education coursetaking. The literature on gender described the evolution of thought on gender identity and gender roles, beginning with Terman and Miles' (1936) dichotomous characterization of masculinity and femininity. Since then, a continuum of studies has captured the development of gender beliefs over time. Constantinople (1973) contradicted the prevailing theory of unidimensional gender constructs and Bem's (1974) findings on masculinity, femininity, and androgyny supported this notion. Current research suggests that gender identity is not as simple as bipolar masculinity or femininity, but is instead multidimensional in nature (Choi et al., 2009; Edwards & Spence, 1987). This identity is developed at an early age (Tobin et al., 2010) and is based upon biological, psychological, and social factors (Bussey & Bandura, 1999; Tobin et al., 2010).

The development of gender identity also brings about certain stereotypes that are inherent to one's gender. This was also explored in the literature review. Eagly (1997) asserted that these gender stereotypic expectancies are derived from societal beliefs regarding the behavior of males and females. While some scholars suggested that gender roles and their associated stereotypes can be modified (Clarey, 1985), others argued that they are prescriptive and serve as limiters for male and female behavior (Heilman, 2001). One area in which gender stereotypes are overwhelmingly prevalent and influential on human behavior is occupational choice. Many occupations remain gender-stereotypic, in part because of societal gender beliefs and perceptions (Couch & Sigler, 2001). A

person's gender beliefs and internalized gender role explain differences in career preferences (Evans & Diekman, 2009) and self-perceived ability to succeed in certain occupational fields (Correll, 2004; Oswald, 2008).

The research on the impact of gender on occupational choice was also reviewed in-depth within this literature review. Gottfredson's (1981) theory of circumscription and compromise explained the process by which individuals select and eliminate careers based upon their gender. In general, males tend to select masculine-oriented jobs while females select female-oriented occupations (Marini et al., 1996; U.S. Census Bureau, 2012; Weisgram et al., 2010). The avoidance of gender-role conflict is proffered as one reason why people self-select themselves into gender traditional careers (Chusmir & Koberg, 1988). While some research suggests that people make occupational choices as a result of values (Evans & Diekman, 2009; Marini et al., 2002; Weisgram et al., 2011), others suggest that career decisions are based upon outside needs such as achieving a work/life balance (Hakim, 2006; Still, 2006). Regardless of the reason, occupational gender segregation is concerning because it leads to pay disparities between men and women (commonly referred to as the gender wage gap) since male-oriented careers typically pay more (Cross & Bagilhole, 2002; Hogue et al., 2010; Huffman & Cohen, 2004).

Once occupational and wage equality became a social issue, women were encouraged to pursue male-dominated careers (Hayes, 1986). Such "nontraditional careers" are defined as careers in which the minority gender makes up less than 25% of the workforce for that occupational field (U.S. Department of Labor, 2010). A review of the literature found that the impact of pursuing a nontraditional career is mixed for both

men and women. Women who pursue nontraditional careers experience benefits such as higher pay (Hogue et al., 2010) and status (Wilbourn & Kee, 2010) but face barriers such as bias, discrimination, and harassment based upon their gender (Eardley & Manvell, 2006). Males who pursue nontraditional careers face social stigma (Lease, 2003, Wilbourn & Kee, 2010) and experience role strain that results from gender identity conflicts (Simpson, 2005) but they tend to benefit from their social advantage in terms of promotions and career advancement (Williams, 1992). Currently women are more likely than men to pursue nontraditional careers (Eardley & Manvell, 2006; Lease, 2003; Wilbourn & Kee, 2010); however, in an increasingly tight labor market where female-dominated service sector jobs are projected to increase the most over the next decade (U.S. Bureau of Labor Statistics, 2012), supply and demand might necessitate that more men pursue nontraditional careers in order to obtain employment (Dodson & Borders, 2006).

Education can play a major role when it comes to preparing individuals for nontraditional employment. The United States has a fairly comprehensive secondary program of education dedicated to career preparation, known as career and technical education (CTE). This literature review examines the research on CTE and gender equity in occupational training. Research suggests that CTE programs are generally segregated along gender lines despite legislative efforts to encourage nontraditional participation (Eardley & Manvell, 2006; Lufkin et al., 2007; NWLC, 2005; Sayman, 2007). This impacts both occupational choice and earning power in the labor market (Ainsworth & Roscigno, 2005; Eardley & Manvell, 2006; NWLC, 2005) as well as postsecondary degree choice since high school coursetaking influences the types of degrees that people

pursue in college (Adelman, 2006; Ma, 2011). In order to increase nontraditional participation, scholars suggest remedies such as exposing students to career development programs sooner before gender roles are ingrained (Gottfredson & Lapan, 1997, Lufkin et al., 2007), improving teacher education on gender equity within their educational practice (Sayman, 2007), using learning materials that reflect nontraditional genders in certain professions (Smith, 2006), and providing career counseling and nontraditional mentors (Lufkin et al., 2007).

The contents of this literature review overwhelmingly suggest that gender plays a substantial role in influencing occupational decision-making and career preparation in secondary education. Research indicates that these early influences are subsequently manifested in the career choices and postsecondary studies that men and women pursue. Efforts have been made to correct gender imbalances within career preparation programs, but thus far they have had minimal impact. The research gaps revealed within this literature review make a compelling case to warrant further exploration of the relationships among gender, coursetaking, and the outcomes of high school CTE students in order to add to the existing body of research and possibly inform future policy decisions, curricular approaches, and student recruitment to CTE programs.

CHAPTER III

METHOD

Study Purpose

Although current research leaves little room for debate that gender segregation in CTE persists, not much is known about the extent of the impact of this imbalance. The prevailing theory is that gender segregation in CTE leads to continued gender segregation in the workforce; however, the magnitude of such effects warrants further investigation. The purpose of this study was to ascertain the extent of the relationships between gender and high school CTE coursetaking and outcomes in order to add to the existing body of knowledge regarding gender equity in the workforce and the prevalence of occupational gender segregation.

Research Design

The current study is quantitative in nature and employed a nonexperimental correlational design using a nonrandom sample of existing student data. The study was considered nonexperimental because no variable in the dataset was manipulated. The sample was considered nonrandom because students self-selected themselves into CTE courses rather than being randomly assigned for experimental purposes (Shavelson, 1996). Data were analyzed using descriptive statistics, logistic regression, multinomial logistic regression, and factorial ANOVA statistical procedures. The analysis made use of descriptive statistics to assess students' CTE participation rates by program area and

gender, factorial ANOVA to compare sample means, and multinomial and logistic regression to examine the relationship between nontraditional coursetaking, student transition outcomes, and anticipated income based on a chosen career field.

Research Questions

Research questions that were addressed in this study included:

- 1) Is gender a significant predictor of nontraditional CTE coursetaking?
- 2) Is gender a significant predictor of CTE certifications/credentials earned?
- 3) What are the predicted postsecondary outcomes for male and female nontraditional CTE completers?
- 4) Is there a significant difference between the estimated wage earnings for male and female CTE participants?

Study Participants

The sample for this study was drawn from a dataset compiled on the most recent graduating class from the Technical Education Database System (TEDS), which is a repository for all data collected on students enrolled in high school CTE courses across Kentucky. Perkins IV mandated data collection on a number of indicators (academic achievement, technical skill attainment, nontraditional participation and completion rates, and post-high school transition data) for all students enrolled in CTE courses in the United States (Meeder, 2008). This dataset included student course enrollment by program area, student completion rates, nontraditional enrollment by program area, nontraditional completion rates, industry certifications earned, and six months follow up data that denoted a student's postsecondary transition status. The sample consisted of 269,072 CTE students in grades 9-12 who were enrolled in at least one CTE course from

2010-2012. There were 142,612 students in the 2010-2011 school year and 126,460 in the 2011-2012 school year. Students in the sample represented 14 different program areas and 91 total programs of study. A total of 26,623 students in the sample were 12th grade completers, meaning that they finished a four-course sequence of CTE courses within a program of study and graduated from high school. There were 143,510 male students (53.3%) and 125,562 female students (46.7%) in the sample.

Validity

This particular sample was selected with external validity as a priority, due to the fact that it represented all CTE concentrations offered across the nation (including nationally required industry certification exams) as well as students from both urban and rural backgrounds. It also included data from concentrated technology centers and traditional high schools. Shadish, Cook, & Campbell (2002) noted that data used in nonexperimental methods often produce more representative samples that promote external validity. The size of the sample is also a positive, as it addressed any threats to power (Shavelson, 1996).

While this study prioritized external validity over internal validity, the lack of current research and the potential implications for educational policy justified the tradeoffs. In terms of this particular sample, the major tradeoff was with internal validity, as there was no way to control for the history of the participants or maturation effects. Since this was a nonexperimental correlational design, making causal inferences was not a priority, however, ambiguous temporal presence remained a threat because there was no way of determining which variable was the cause or the effect when it came to student transition decisions. Statistical conclusion validity was also a tradeoff, as the researcher

relied on a sample consisting of data collected by others (including self-reports from students regarding transition information), leaving the study open to the threat of unreliability of measures, as well as a wide variety of extraneous variance (e.g. quality of programs, parental influence and support, personal motivation) that might have impacted student participation and completion.

Procedure

The researcher submitted a proposal to the university institutional review board and the state department of education. After securing approval from both entities, the data collection procedures began. An official from the state department of education pulled student data from 2010-2012 and removed any information that would allow someone to identify the student, school, or district. The dataset was then sent to the researcher via email.

Study Variables

As described in the study purpose, the primary objective of this study was to explore relationships between gender and high school CTE coursetaking and outcomes. For the purpose of this study, primary variables under investigation included: gender, CTE coursetaking, certifications earned, secondary placement outcome, and estimated income.

Gender served as an independent variable and was measured as either male or female. Male and female subjects were originally coded as male (= 1) and female (= 2) but were later converted to female (= 0) and male (= 1) in order to meet the requirements for certain statistical analyses.

Coursetaking was defined as enrollment in at least one CTE course. Typically

students are designated as either CTE “participants” (students who have taken one course in a program area) or CTE “completers” (students who have take three or more courses in a particular program) (Justensen, 2007). For the purpose of this study, a completer was defined according to the criteria set forth by the Kentucky Department of Education: A “secondary student who earned four credits in the same CIP code and graduated from high school” (KDE, 2010, p. 146). Coursetaking was coded based upon the designated CTE program area that students from the sample have participated in. There were a total of 14 program areas represented in the study (coded as Agriculture and Natural Resources = 1, Architecture and Construction = 2, Arts, A/V Technology, and Communications = 3, Business and Administration = 4, Finance = 5, Health Science = 6, Hospitality and Tourism = 7, Human Services = 8, Information Technology = 9, Law and Public Safety = 10, Manufacturing = 11, Retail/Wholesale Sales and Service = 12, Science, Technology, Engineering, and Mathematics (STEM) = 13, and Transportation, Distribution, and Logistics = 14). Each student’s individual program area was also denoted and students were further coded as either program participants (= 1) or program completers (= 2). Additionally, students within the sample were coded based upon the gender traditionality of the program in which they participated. Students were coded as either gender traditional (= 0) or gender nontraditional (= 1). The gender traditionality designation was based upon a list of nontraditional occupations that is provided to the Kentucky Department of Education by the U.S. Department of Labor and based upon census data (KDE, 2010).

Certifications earned was measured based upon whether or not students achieved the required test score on an industry certification exam for a particular field of study. For

the purpose of this study, industry certificates were defined as “credentials for which the student must pass a test that has been validated/approved by the business or industry,” (KDE, 2010, p. 41). Certifications were coded as either did not earn a certification (= 0) or earned a certification (= 1) for each program completer.

Student outcome was defined as a student’s postsecondary transition status to either employment, postsecondary education, or military service and is a required measurement under Perkins IV (Justenson, 2007). Outcome data were collected within six months of student graduation by contacting CTE students who were both program completers and high school graduates (KDE, 2010). In this study, student outcome was a dependent variable that was measured by participation in college, work, military service, or none. Specifically, student outcome was coded as: Employed in an apprenticeship (= 1), employed in a field related to CTE program of study (= 2), employed in a field not related to CTE program of study (=3), employed in field related to CTE program of study and pursuing postsecondary education (= 4), enlisted in military service (= 5), pursuing postsecondary education related to CTE program of study (= 6), pursuing postsecondary education not related to CTE program of study (= 7), self-employed (= 8), unemployed (= 9), unknown (= 10).

Estimated income was defined as the average annual salary for a particular occupational field. Although the ideal estimation of income would be based upon hourly wages (Blau & Khan, 2007), the dataset does not allow the researcher to account for fluctuations of wages throughout an individual’s career trajectory. Additionally, since the occupations included in the study are a mix of hourly and salaried positions, hourly wage data were not available for all occupations, making it impossible to make a

common wage comparison based upon hourly wages. Therefore, the researcher chose to use the average salary of full-time workers in each occupational field as a means to measure and compare potential future earnings. This variable was derived through a multi-step process that included matching each of the 91 program CIP codes with an occupation from the most recent version of the National Occupational Employment and Wage Estimates (U.S. Bureau of Labor Statistics, 2012). All courses are assigned a six digit CIP code that was developed by NCES as a means to classify courses for reporting purposes (NCES, 2013). The researcher used the NCES CIP to SOC crosswalk to compare each course CIP code with its associated standard occupational classification (SOC) (NCES, 2010). Once course CIP codes had been converted to SOC codes, they were matched with mean annual income estimates provided by the Bureau of Labor Statistics (2012).

Statistical Analysis

Research Questions One and Two

- 1) Is gender a significant predictor of nontraditional CTE coursetaking?
- 2) Is gender a significant predictor of CTE certifications/credentials earned?

In order to address questions one and two, a combination of descriptive statistics and logistic regression was proposed. Regression is a statistical technique that allows a researcher to predict a dependent variable based on a set of predictors (Stevens, 2009). Logistic regression allows a researcher to predict group membership by calculating the probability that an event will occur, yielding an odds ratio. Logistic regression is also preferred because its assumptions are not as strict as other statistical analyses (Meyers, Garnst, & Guarino, 2006).

The fundamental principles underlying logistic regression are similar to linear regression, however, instead of predicting the value of a dependent variable based upon the values of the predictor variable(s), a researcher is predicting the probability of the dependent variable occurring. In a binary logistic regression with a single predictor variable, the prediction equation is: $P(Y) = 1 / 1 + e^{-(b_0 + b_1 x_{1i})}$ where $P(Y)$ is the probability of the dependent variable occurring, e is the base of natural logarithms, b_0 represents the constant, b_1 represents the coefficient, and x_1 represents the predictor variable (Field, 2009).

In a binary logistic regression with a dichotomous categorical predictor, there are four possible outcomes that can be best expressed in a classification table:

	Predicted Positive	Predicted Negative
Observed Positive	a	c
Observed Negative	b	d

Typically a cutoff value of .50 (50% probability) is chosen with values greater than .50 considered as positively predicting an event and values less than .50 as not predicting an event. The researcher attempts to find the model that most accurately predicts the dependent variable compared to the observed cases of the dependent variable occurring. In a perfect model (100% correct predictions), all cases would fall along the diagonal (a or d). When running a statistical analysis in SPSS, an initial classification table is developed based only on the null model with no predictors included. An overall percentage is reported to show the percent of cases for which the dependent variable was correctly predicted. A second classification table is then developed based on the full

regression model that includes any significant predictors and another overall percentage is reported. The full model classification table can then be compared to the null model as a measure of the extent to which the full model improves upon the null model in terms of predictive accuracy.

When conducting logistic regression, it is important to make a distinction between assessing predictors within an equation and assessing the overall model for measures of fit. It is quite possible to have a poor fitting model with significant predictors and likewise, it is possible to have a good fitting model with no significant predictors. In terms of predictors within a logistic regression, a relationship must exist between the predictor variables and the dependent variable. The significance of this relationship is typically assessed using the Wald statistic (Field, 2009). Once a significant relationship has been established, the researcher tests whether or not the model is improved by adding additional predictor variables. The odds ratio is then interpreted to determine the amount of change in the odds of an event occurring for one unit change in the predictor (Meyers et al., 2006).

In terms of assessing model fit, a researcher has multiple options. One way is to compare the full model's overall percentage of correct classifications with the percentage of correct classifications from the null model. An increase in the percentage of overall correct classifications could indicate good model fit. Another method is to consider the log likelihood, which also uses the observed and predicted values to gauge model fit. A large log likelihood statistic indicates poor model fit because it indicates a large number of unexplained observations. Yet another method of assessing model fit is the Hosmer-Lemeshow statistic, which tests goodness-of-fit for the model, or how well the model fits

the data. The Hosmer-Lemeshow statistic yields a p -value that can be interpreted as $p > .05$ means the model has acceptable fit or $p < .05$ means the model has poor fit (Field, 2009).

Unlike linear regression, which produces a R^2 statistic that explains the proportion of explained variance, logistic regression does not produce the same type of R^2 statistic. Logistic regression instead uses two pseudo- R^2 statistics in order to estimate the proportion of variance in the dependent variable that is explained by the predictive model. Both the Cox and Snell R^2 and the Nagelkerke R^2 are commonly used pseudo- R^2 statistics. The Cox and Snell R^2 uses the log-likelihood of the new model, the log-likelihood of the null model, and the sample size in its calculation, but its maximum is less than 1. The Nagelkerke R^2 amends the Cox and Snell measure so that its maximum reaches 1 in order to better gauge the extent of a model's significance (Field, 2009).

Logistic regression was proposed for research questions one and two because the independent and dependent variables for both questions were categorical. For research question one, the independent variable, gender, is a categorical variable with two levels. The dependent variable, nontraditional CTE coursetaking, is a dichotomous categorical variable that denotes group membership as either traditional or nontraditional.

Specifically, the following hypothesis was tested for question one:

H_0 : Gender is not a significant predictor of nontraditional CTE coursetaking.

For research question two, gender was again a categorical independent variable and the dependent variable was certifications earned, which was also a dichotomous categorical variable for which group membership was determined. The following hypothesis was tested:

H₀: Gender is not a significant predictor of earning an industry certification or credential.

Research Question Three

- 3) What are the predicted postsecondary outcomes for male and female nontraditional CTE completers?

The purpose of question three was to predict postsecondary student outcomes. The independent variables were all categorical: Gender (two levels), program area (14 levels), and certifications earned (two levels, coded as yes or no). The dependent variable was secondary placement outcome, a polychotomous categorical variable that has 10 levels (coded as 1 = employed in an apprenticeship, 2 = employed in a field related to CTE program of study, 3 = employed in a field not related to CTE program of study, 4 = employed in field related to CTE program of study and pursuing postsecondary education, 5 = enlisted in military service, 6 = pursuing postsecondary education related to CTE program of study, 7 = pursuing postsecondary education not related to CTE program of study, 8 = self-employed, 9 = unemployed, 10 = unknown). Since the dependent variable is categorical but not dichotomous, multinomial logistic regression was the preferred method of statistical analysis. For this research question, gender, program area, and credentials earned served as the variables used to predict student outcomes.

Multinomial logistic regression follows the same principles previously discussed for logistic regression in research questions one and two; however, instead of predicting a dichotomous dependent variable, multinomial regression predicts an outcome variable with more than two categories. Since there are multiple independent variables for this research question, forward entry was used to enter the predictor variables into the model.

In this method of entry, variables are entered one by one, with the variable with the largest significant Pearson r entering the equation first. Excluded variables are evaluated for significance, and then are added to the model one by one to maximize explained variance. An equation is derived from the predictors that make a statistically significant contribution and explain the greatest amount of variance (Field, 2009).

Specifically, the following hypothesis was tested:

H_0 : There are no significant predictors for postsecondary outcomes for male and female nontraditional CTE students.

Research Question Four

- 4) Is there a significant difference between the estimated wage earnings for male and female CTE completers?

The purpose of question four was to ascertain whether or not a significant difference exists based upon predictions of estimated wage earnings for male and female CTE students. For this question, there were two categorical independent variables—gender and program area—and one continuous dependent variable—estimated income. This study used a 2 x 14 ANOVA design. The independent variable gender had two levels (male or female) and the independent variable program area had 14 levels (Agriculture and Natural Resources, Architecture and Construction, Arts, A/V Technology, and Communications, Business and Administration, Finance, Health Science, Hospitality and Tourism, Human Services, Information Technology, Law and Public Safety, Manufacturing, Retail/Wholesale Sales and Service, STEM, and Transportation, Distribution, and Logistics). The dependent variable, estimated salary, was estimated based upon the average annual salaries for individual occupational fields.

In order to estimate income, subcategories (programs) within each program area were compared with Bureau of Labor Statistics wage estimates to ascertain a mean wage for each occupation, then a mean wage was calculated for each program area based upon the average wages for each individual program within that program area. This yielded a mean expected income for each program area.

Factorial ANOVA was selected as the preferred statistical method because ANOVA allows a researcher to test for significance of main and interaction effects (Shavelson, 1996). A two-way factorial ANOVA involves testing the sample means of two independent variables (in this case gender and program area) to see if there is a statistically significant difference for the dependent variable (estimated income). Advantages of a factorial ANOVA include gaining more information from a single study (economical and efficient), more precise estimates of error variance (due to accounting for the variance of more than one variable), and the ability to study interaction effects (Stevens, 2007).

The assumptions for this design were independence, normality, and homogeneity of variance. Independence assumes that scores or participants are randomly and independently sampled. Each subject should be independent of all other subjects and have no bearing on the results of others. Normality means that the scores in the population are normally distributed. This assumption can be checked using a histogram. Homogeneity of variance assumes that the variances of scores in the two populations are equal. Typically, the Levene statistic is used to determine the equality of variances (Field, 2009)

In addition to providing information on the significance of main and interaction effects, a factorial ANOVA also yields effect size statistics. The effect size measures the proportion of variance in the dependent variable accounted for by knowing the independent variable(s) (Field, 2009). Effect sizes can be reported as either an omega-squared (ω^2) or an eta-squared (η^2) statistic. According to Cohen (1977), effect sizes can be interpreted as small effects (.01-.06), medium effects (.06-.15), or large effects (.15+).

Specifically, the following hypotheses were tested:

H₀: There is no significant difference between the means of the samples for gender.

(Gender has no effect on estimated income.)

H₀: There is no significant difference between the means of the samples for program area.

(Program area has no effect on estimated income.)

H₀: There is no significant interaction between gender and program area.

Table 1

Summary of Research Questions, Variables, and Statistical Analysis

Research Question	Independent Variable(s)	Dependent Variable	Statistical Analysis
1	Gender	Nontraditional Participation	Descriptive statistics, Logistic regression
2	Gender	Credentials earned	Descriptive statistics, Logistic regression
3	Gender, program area, certification earned	Secondary placement outcome	Multinomial logistic regression
4	Gender, program area	Estimated income	ANOVA

CHAPTER IV

RESULTS

This chapter presents the results of the study, beginning with descriptive statistics of the sample followed by findings related to the four research questions.

Sample Characteristics

An analysis of descriptive statistics revealed that the overall sample consisted of a total of 269,072 CTE students in grades 9-12 who were participants in at least one CTE course from 2010-2012 in Kentucky. There were 143,510 male students (53.3%) and 125,562 female students (46.7%) in the sample. These students were enrolled in a total of 14 program areas, encompassing 91 separate programs of study. Within the overall sample, there were 26,623 students in the sample that were 12th grade completers, meaning that they finished a four-course sequence of CTE courses within a program of study and graduated from high school. There were 14,165 male completers and 12,458 female completers. No additional participant information was made available from the Kentucky Department of Education in order to preserve the anonymity of the students included in the sample.

The sample size was determined to be adequate to achieve the desired power (.90), effect size (.75), and confidence level (95%) based upon the state's student population of approximately 650,000 students in each of the school years represented in the sample. Stevens (2007) presented a ratio of 15:1 (15 cases per independent variable

to 1 dependent variable) in order to achieve adequate power and significance. The sample used in this study far exceeded the minimum recommendations. However, it is important to note that although larger sample sizes are associated with increased power and significance, they can impact the magnitude of the effect being detected (Shavelson, 1996).

Data Analysis

Research Question 1

The question posed was: Is gender a significant predictor of nontraditional CTE coursetaking? In the sample used for this analysis, $N = 269,072$. Males accounted for 53.3% of the sample ($n = 143,510$) and females comprised 46.7% of the sample ($n = 125,562$). Table 2 displays coursetaking by gender.

Table 2

Coursetaking by Gender

<u>Gender</u>	<u>Traditional</u>	<u>Nontraditional</u>	<u>Total</u>
Female	94,930	30,632	125,562
Male	101,673	41,837	143,510
Total	196,603	72,469	269,072

Note. 0 = Female, 1 = Male; 0 = Traditional, 1 = Nontraditional.

In terms of coursetaking, 26.9% of students ($n = 72,469$) were enrolled in a gender nontraditional course and 73.1% of students ($n = 196,603$) were enrolled in a gender traditional course. Nearly one-fourth (24.1%) of females took a nontraditional course compared with 29.2% of males.

Before performing a logistic regression on the data to determine whether or not gender was a significant predictor of nontraditional coursetaking, it was important to first ascertain whether or not gender and coursetaking were even related. A chi square test was conducted with a null hypothesis of H_0 : Gender and nontraditional coursetaking are independent. The results of this analysis suggested that gender and coursetaking are related $\chi^2(1) = 769.996, p < .001$. Since this was a 2 x 2 analysis (two categorical variables that had two categories each), Yates's continuity correction was applied to ensure that no Type I errors had been made. The results of the chi square were still significant $\chi^2(1) = 769.754, p < .001$, indicating that gender and coursetaking are related and therefore making the subsequent logistic regression a pertinent analysis.

Prior to conducting the logistic regression analysis, the researcher checked to ensure that no assumptions of logistic regression were violated. Although logistic regression has less stringent assumptions than linear regression (Meyers et al., 2006), it still retains assumptions such as linearity between continuous predictors and the logit of the dependent variable, independence of errors, and an absence of multicollinearity (Field, 2009). Since the predictor variable in this analysis was not continuous, linearity was not violated. Students in the sample were independently sampled, so this assumption was met. Multicollinearity was checked by tolerance and VIF statistics, which indicate the strength of association between a predictor variable and other predictors. Stevens (2009) suggests a $VIF > 10$ or a tolerance $< .1$ indicate potential issues with multicollinearity. The data used in this analysis did not violate either threshold ($VIF < 10$, tolerance $> .1$), thus it was concluded that the assumption of multicollinearity was met.

A logistic regression analysis was then conducted to predict nontraditional coursetaking using gender as a predictor. The results are displayed in Table 3.

Table 3

Logistic Regression Analysis of Nontraditional Coursetaking

<u>Variable</u>	<u>B</u>	<u>S.E.</u>	<u>Wald</u>	<u>Sig.</u>	<u>Exp(B)</u>
Gender	.243	.009	768.413	.000	1.275
Constant	-1.131	.007	29629.099	.000	.323

Note. $R^2 = .000$ (Hosmer & Lemeshow), $.003$ (Cox & Snell), $.004$ (Nagelkerke). Model ($\chi^2(1) = 772.696$, $p < .001$). 0 = Female, 1 = Male; 0 = Traditional, 1 = Nontraditional.

The classification table of the null model predicted nontraditional coursetaking by males and females with 73.1% accuracy. Gender was entered as a predictor variable and according to the omnibus test of model coefficients, it significantly improved the prediction model ($\chi^2(1) = 772.696$, $p < .001$). According to the Wald test, gender was a significant predictor ($p < .001$). OR = 1.275, suggesting that the odds are 1.275 times greater that males will take nontraditional courses than females.

Although the analysis suggested that gender was a significant predictor of nontraditional coursetaking, issues arose when analyzing model fit. The classification table for the final model still only predicted nontraditional coursetaking with 73.1% accuracy, demonstrating no improvement over the null model. The Hosmer-Lemeshow test indicated poor model fit as well ($\chi^2(0) = .000$, $p < .001$). Further analysis of the Cox and Snell ($R^2 = .003$) and Nagelkerke ($R^2 = .004$) pseudo R -squares showed that the final model with gender as a predictor explained just 0.3% and 0.4% of the variance in the

dependent variable. Therefore, although gender is a significant predictor, it can be concluded that it is a weak predictor of nontraditional coursetaking.

Research Question 2

The question under investigation was: Is gender a significant predictor of CTE certifications/credentials earned? The sample used for this analysis was actually a subset of the full sample and involved only students who were CTE completers and graduates (and thus had the opportunity to take an industry certification exam). For this analysis, $N = 26,623$. Males accounted for 53.2% of the sample ($n = 14,165$) and females comprised 46.8% of the sample ($n = 12,458$). Table 4 displays certifications earned by gender.

Table 4

Certifications Earned by Gender

<u>Gender</u>	<u>Not Earned</u>	<u>Earned</u>	<u>Total</u>
Female	10,211	2,247	12,458
Male	12,423	1,742	14,165
Total	22,634	3,989	26,623

Note. 0 = Not earned, 1 = Earned.

In terms of certifications earned, 15% of students ($n = 3,989$) earned some type of industry certification and 85% ($n = 22,634$) did not earn an industry certification. Females earned 56% of all certifications with males earning 44% of the total certifications. 18% of female CTE completers graduated high school with an industry certification compared with 14% of male CTE completers.

Prior to performing a logistic regression on the data to determine whether or not gender was a significant predictor of industry certifications earned, it was important to

first ascertain whether or not gender and industry certifications were even related or else the logistic regression would be unnecessary. A chi square test was conducted with a null hypothesis of H_0 : Gender and industry certifications are independent. The results of this analysis suggested that gender and industry certifications are related $\chi^2(1) = 171.365, p < .001$. Yates's continuity correction was applied since this was a 2 x 2 analysis. The results of the chi square were still significant $\chi^2(1) = 170.915, p < .001$, indicating that the null hypothesis should be rejected and the conclusion could be drawn that gender and industry certifications are related. Based upon these results, the researcher proceeded with the logistic regression.

Once again, the researcher checked to ensure that no assumptions of logistic regression were violated. Since the predictor variable in this analysis was not continuous, linearity was not violated. Students in the sample were independently sampled, so this assumption was met. Multicollinearity was checked by tolerance and VIF statistics and did not violate either threshold (VIF < 10, tolerance > .1).

A logistic regression analysis was then conducted to predict earning industry certifications using gender as a predictor. The results are displayed in Table 5.

Table 5

Logistic Regression Analysis of Industry Certifications

<u>Variable</u>	<u>B</u>	<u>S.E.</u>	<u>Wald</u>	<u>Sig.</u>	<u>Exp(B)</u>
Gender	-.451	.035	169.585	.000	.637
Constant	-1.514	.023	4220.850	.000	.220

Note. $R^2 = .000$ (Hosmer & Lemeshow), .006 (Cox & Snell), .011 (Nagelkerke). Model ($\chi^2(1) = 171.102, p < .001$). 0 = Not earned, 1 = Earned.

The classification table of the null model predicted industry certifications by males and females with 85.0% accuracy. Gender was entered as a predictor variable and according to the omnibus test of model coefficients, it significantly improved the prediction model ($\chi^2(1) = 171.102, p < .001$). According to the Wald test, gender was a significant predictor ($p < .001$). OR = .637, suggesting that the odds of a male earning an industry certification are less than the odds of a female earning an industry certification. For every one unit change in the predictor variable (males), the amount of change in the odds of the dependent variable (earning an industry certification) decrease by .637. The inverse of the odds ratio is 1.569, which indicates that females are 1.569 times more likely to earn an industry certification than males. This is consistent with the data that showed a greater percentage of females earning industry certifications than males.

However, an analysis of model fit suggested that these results should be interpreted with caution. Although the analysis suggested that gender was a significant predictor of earning industry certifications, the classification table for the final model still only predicted certifications earned with 85.0% accuracy, demonstrating no improvement over the null model. The Hosmer-Lemeshow test indicated poor model fit as well ($\chi^2(0) = .000, p < .001$). Further analysis of the Cox and Snell ($R^2 = .006$) and Nagelkerke ($R^2 = .011$) pseudo R -squares showed that the final model with gender as a predictor explained just 0.6% and 1.1% of the variance in the dependent variable. Therefore, although gender is a significant predictor, it can be concluded that it is a very weak predictor of earning industry certifications. Given such a small pseudo- R^2 , the significance of the predictor was likely found due to the large sample size.

Research Question 3

The question posed was: What are the predicted postsecondary outcomes for male and female nontraditional CTE completers? For this question, the sample was again comprised of a subset of the full sample and consisted only of nontraditional CTE completers and graduates (those students who completed a program and transitioned to some type of post-high school activity). For this question, $N = 5334$. Transition outcomes for all completers (traditional and nontraditional) are displayed in Table 6.

Table 6

Transition Outcomes for All Completers

Program Area	Apprenticeship	Employed in Same CTE Field	Employed in Different Field	Employed in Field + Post-Sec. Ed.	Military	Post-Sec. Ed. in Same CTE Field	Post-Sec. Ed. In Different Field	Self-Employed	Unemployed	Unknown
Ag & Natural Resources	0%	15.7%	20.2%	3.8%	2.1%	25.2%	26.1%	0.2%	4.8%	1.5%
Architec. & Cons.	0.6%	14.3%	21.8%	1.9%	4.1%	19.6%	19.5%	0.7%	10.7%	6.1%
Arts, A/V Tech.	0%	1.4%	14.9%	1.1%	1.8%	31.5%	39.6%	0%	4.7%	4.7%
Business & Admin.	0.1%	7.8%	8.7%	4.2%	2.0%	46.2%	23.5%	0.1%	4.4%	2.4%
Finance	0%	5.3%	15.8%	0%	2.6%	39.5%	10.5%	0%	13.2%	10.5%
Health Sciences	0%	9.5%	6.9%	5.9%	0.6%	60.0%	6.9%	0.1%	4.7%	4.6%
Hosp. & Tourism	0%	8.6%	2.9%	2.9%	2.9%	68.6%	5.7%	2.9%	2.9%	2.9%
Human Services	0.1%	12.6%	11.7%	3.4%	0.9%	30.3%	32.9%	0.4%	5.9%	1.2%
Info. Tech	0.1%	3.9%	11.1%	1.4%	2.9%	42.0%	27.2%	0.2%	6.3%	4.7%
Law & Pub. Safety	0%	2.4%	30.2%	4.8%	8.7%	27.0%	15.9%	0%	10.3%	0.8%
Manufacturing	0.3%	23.8%	19.4%	1.8%	3.6%	21.3%	11.4%	0.8%	9.2%	7.5%
Retail/Sales	0.1%	8.5%	8.3%	4.1%	1.1%	41.3%	31.4%	0.1%	3.3%	1.8%
STEM	0.1%	6.9%	14.1%	2.9%	2.1%	42.1%	24.8%	0.8%	4.9%	1.0%
Transport./Distribut.	0.1%	17.5%	22.4%	1.4%	4.6%	19.7%	12.0%	0.8%	10.0%	11.2%
Total	0.1%	11.8%	13.7%	3.5%	2.1%	36.2%	22.2%	0.3%	5.7%	4.4%

There were 10 possible outcomes for which data were collected, as shown in Table 11. The most common outcomes for all CTE completers were pursuing postsecondary education in the same CTE program area as high school (36.2%) and pursuing postsecondary education in a different field (22.2%), followed by employment in a different field (13.7%) and employment in the field for which the took high school CTE courses (11.8%). Apprenticeships and self-employment were the least common outcomes, comprising just 0.4% of the overall student outcomes.

Table 7 displays the transition outcomes for male nontraditional CTE completers ($n = 2993$). Of the 14 program areas offered, only 5 contained male nontraditional completers: Agriculture and Natural Resources, Business and Administration, Finance, Health Sciences, and Human Services. The other nine program areas did not offer programs that were nontraditional for males or did not have any males participate in programs that would have been nontraditional for their gender. For male CTE completers, the most common transition outcome categories mirrored the overall sample: pursuing postsecondary education in the same CTE program area as high school (39.2%), pursuing postsecondary education in a different field (22.2%), employment in a different field (13.3%), and employment in the field for which the took high school CTE courses (9.6%).

Table 7

Transition Outcomes for Male Nontraditional CTE Completers

Program Area	Apprenticeship	Employed in Same CTE Field	Employed in Different Field	Employed in Field + Post-Sec. Ed.	Military	Post-Sec. Ed. in Same CTE Field	Post-Sec. Ed. In Different Field	Self-Employed	Unemployed	Unknown	Total
Ag & Natural Resources	0	122	150	22	22	127	162	1	33	10	649
Arc. & Cons.	-	-	-	-	-	-	-	-	-	-	0
Arts, A/V Tech.	-	-	-	-	-	-	-	-	-	-	0
Business & Admin.	1	148	214	82	72	903	458	2	109	67	2056
Finance	0	1	0	0	0	4	0	0	2	1	9
Health Sciences	0	13	19	19	4	117	27	0	5	9	213
Hosp. & Tourism	-	-	-	-	-	-	-	-	-	-	0
Human Services	0	3	16	0	3	21	16	0	5	2	66
Info. Tech	-	-	-	-	-	-	-	-	-	-	0
Law & Pub. Safety	-	-	-	-	-	-	-	-	-	-	0
Manufacturing	-	-	-	-	-	-	-	-	-	-	0
Retail/Sales	-	-	-	-	-	-	-	-	-	-	0
STEM	-	-	-	-	-	-	-	-	-	-	0
Trans./Dist/Logistics	-	-	-	-	-	-	-	-	-	-	0
Total	1	287	399	123	102	1172	663	3	154	89	2993

Table 8 shows the transition outcomes for female nontraditional CTE completers (n = 2341). All but four of the 14 program areas offered had female nontraditional completers. The exceptions were Finance, Health Sciences, Hospitality and Tourism, and STEM. For females, the most common outcomes were: Pursuing postsecondary education in a different field than high school (33.5%), pursuing postsecondary education in the same CTE program area as high school (33.0%), employment in a different field (12.3%), and employment in the field for which the took high school CTE courses (8.8%).

Table 8

Transition Outcomes for Female Nontraditional CTE Completers

Program Area	Apprenticeship	Employed in Same CTE Field	Employed in Different Field	Employed in Field + Post-Sec. Ed.	Military	Post-Sec. Ed. in Same CTE Field	Post-Sec. Ed. In Different Field	Self-Employed	Unemployed	Unknown	Total
Ag & Natural Resources	0	50	110	23	1	257	178	0	28	7	654
Arc. & Cons.	0	2	31	4	1	25	62	0	16	5	146
Arts, A/V Tech.	0	2	9	0	0	18	41	0	2	0	72
Business & Admin.	0	29	18	16	2	224	96	0	12	6	403
Finance	-	-	-	-	-	-	-	-	-	-	0
Health Sciences	-	-	-	-	-	-	-	-	-	-	0
Hosp. & Tourism	-	-	-	-	-	-	-	-	-	-	0
Human Services	0	94	43	23	4	129	261	2	30	11	597
Info. Tech	0	3	9	1	0	52	67	1	7	10	150
Law & Pub. Safety	0	1	14	2	1	13	10	0	8	1	50
Manufacturing	0	12	28	0	3	18	39	0	14	9	123
Retail/Sales	0	7	4	0	0	25	2	0	6	1	45
STEM	-	-	-	-	-	-	-	-	-	-	0
Trans./Dist/Logistics	0	7	22	2	3	12	29	1	13	12	101
Total	0	207	288	71	15	773	785	4	136	62	2341

Prior to conducting the analysis, the researcher tested the assumptions of logistic regression to confirm that no assumptions were violated. Linearity was not violated since the predictor variable in this analysis was not continuous. All students in the sample were independently sampled of one another, so this assumption was met.

Multicollinearity was checked by tolerance and VIF statistics and did not violate either threshold ($VIF < 10$, tolerance $> .1$). The researcher concluded that the assumptions for a multinomial logistic regression were satisfied.

In order to properly assess model fit, it is important to evaluate cell counts to ensure that there are adequate cell frequencies to analyze since goodness-of-fit tests are based upon differences between observed and expected frequencies (Tabachnick & Fidell, 2001). An analysis of the cross tabulations of cell frequencies revealed that 31% of the cells for Transition Outcome x Program Area had expected cell frequencies less than five for the initial sample. This exceeded the recommendation that no more than 20% of cells have a count less than five and that all expected frequencies are greater than one (Tabachnick & Fidell, 2001). The outcome categories of apprenticeship, military, self-employed, unknown, unemployed, and employed in field and pursuing postsecondary education all had expected counts that violated the recommendations. Based upon this information, a decision was made to collapse the outcome categories of apprenticeship, military, self-employed, and unemployed into a new category labeled “other.” The category “employed in field and pursuing postsecondary education” was merged with the “employed in same CTE field” category as well. Any student with the transition category “Unknown” ($n = 151$) was excluded from the sample since no outcome could be ascertained or predicted for them based upon the data. A subsequent

cross tabulation analysis revealed that the minimum cell counts were achieved with the exception of the Finance program area. The researcher concluded that this violation was due to the small sample size for this particular category ($n = 9$) and excluded this program area from the analysis. After merging categories, there were five possible transition outcomes. The final sample size for the analysis was $N = 5,175$.

A multinomial logistic regression analysis was conducted to predict student postsecondary transition outcomes using gender, program area, and industry certifications as predictors. The results are displayed in Table 9.

Table 9

Multinomial Logistic Regression Analysis of Student Transition Outcomes

Predictor Variable	Dependent Variable Category ^a (Transition Outcome)							
	Employed (Related)		Employed (Unrelated)		Postsec. Ed. (Related)		Postsec. Ed. (Unrelated)	
	<i>B</i>	<i>e^B</i>	<i>B</i>	<i>e^B</i>	<i>B</i>	<i>e^B</i>	<i>B</i>	<i>e^B</i>
Gender	.544** (.194)	1.723	.244 (.193)	1.276	1.160*** (.172)	3.190	.907*** (.176)	2.476
Industry Certifications	-3.390*** (.312)	.034	-2.172*** (.312)	.114	.453 (.325)	1.573	1.749*** (.422)	1.382
Agriculture & Nat. Res.	2.146*** (.464)	8.551	1.089** (.371)	2.971	2.471*** (.411)	11.836	1.356*** (.348)	3.880
Architecture & Construct.	-1.793** (.674)	.166	-.333 (.465)	.716	.784 (.493)	2.190	.878* (.413)	2.405
Arts, A/V Tech.	.698 (1.101)	2.009	1.266 (.848)	3.545	2.545* (.835)	12.738	2.484 (.786)	11.991
Business & Administration	1.097* (.474)	2.996	-.007 (.383)	1.073	3.099*** (.416)	22.185	1.130*** (.355)	3.707
Health Sciences	-.240 (.642)	.787	-.955 (.597)	.385	4.325*** (.574)	75.569	2.178*** (.560)	8.833
Human Services	1.704*** (.466)	5.494	.070 (.383)	.993	1.709*** (.415)	5.522	1.421*** (.347)	4.143
Information Technology	-.275 (.774)	.759	-.216 (.589)	.806	2.224*** (.535)	9.245	1.600*** (.483)	4.954
Law & Public Safety	-2.101* (.846)	.122	-.664 (.577)	.515	.786 (.578)	2.194	-.262 (.557)	.769
Manufacturing	-.257 (.595)	.773	.032 (.454)	1.032	.417 (.507)	1.158	.323 (.422)	1.382
Retail/Sales & Services	1.032 (.702)	2.807	-.592 (.723)	.553	1.772** (.591)	5.882	-1.641 (.872)	.194
Constant	1.968***		2.115***		-1.958***		-2.114***	

	χ^2	df	p
Likelihood Ratio Test	1417.902	48	<.001

Note. $N = 5,175$. Standard errors in parentheses. Cox and Snell $R^2 = .240$. Nagelkerke $R^2 = .253$.

^a Other is the reference category.

* $p < .05$, ** $p < .01$, *** $p < .001$

An analysis of model fit showed that the final model significantly predicted student transition outcomes $\chi^2(48) = 1417.902, p < .001$. Also, the -2 Log Likelihood was smaller for the final model than the null model ($548.678 < 1966.580$), which also indicated better fit. The Pearson ($\chi^2(48) = 390.889, p < .001$) and Deviance ($\chi^2(48) = 241.052, p < .001$) goodness-of-fit tests were significant; however, the χ^2 test is known to be very sensitive to a large sample size (Stevens, 2007). Further analysis of the Cox and Snell ($R^2 = .240$) and Nagelkerke ($R^2 = .253$) pseudo R-squares showed that the final model produced adequate sized effects. The Nagelkerke R^2 suggested that the final model explains 25.3% of the variance in student transition outcomes. Taking all measures of fit into consideration, the results indicated that the final model was a significantly better predictor than the null model.

Further analysis indicated that all three predictors were significant. Gender $\chi^2(4) = 92.596, p < .001$, program area $\chi^2(40) = 804.937, p < .001$, and industry certification $\chi^2(4) = 749.013, p < .001$ were all significant contributors to the full model and thus were retained.

In terms of predictive ability, an analysis of the classification table revealed that the final model correctly classified just 46.0% of cases overall. (A perfect model would have predicted all cases correctly.) The prediction for students who transitioned to

postsecondary education within the same CTE field as high school was more accurate than for any other outcome category with 78.8% of cases classified correctly. Correct classification percentages were much lower for the other outcome categories of postsecondary education in an unrelated field (35.2%), employed in an unrelated field (25.6%), and employed in a related field (23.9%). None of the 5,175 cases were correctly predicted to the “other” category that was comprised of apprenticeships, military, self-employment, and unemployment. This appears to be an underprediction considering that these categories accounted for 7.8% of the outcomes of the nontraditional sample. Additionally, although the model correctly predicted more cases in the “postsecondary education in a related CTE field” category, it appears that this category was overpredicted (60.1%) relative to the actual transition rate in the population (36.5%). Likewise, the model appeared to slightly underpredict cases to the “postsecondary education in an unrelated CTE field” category (21.6%) compared to the actual transition rate of 27.1%.

Gender.

Statistical tests of individual predictors revealed that gender has a statistically significant positive effect ($p = .005$) for the probability of students transitioning to postsecondary education in a related CTE field, postsecondary education in an unrelated field, and employment in a CTE-related field. Females were more likely than males to be employed in a CTE-related field after graduation (OR = 1.723). Additionally, being female increased the odds of a student pursuing postsecondary education in a field related to their high school CTE program (OR = 3.190) as well as the likelihood of pursuing postsecondary education in an unrelated field of study (OR = 2.476). Gender did not

have a statistically significant effect on student transitions to employment in an unrelated field.

Industry Certifications.

The predictor variable of earning industry certifications also had a statistically significant effect ($p < .001$) for the probability of students transitioning to employment in a related field, employment in an unrelated field, and pursuing postsecondary education in an unrelated field. Industry certifications did not have a significant effect on the probability of student transitions to postsecondary education in a field of study related to their high school CTE coursework. Students who did not earn an industry certification were less likely to be employed in a related field ($OR = .034$) than students who earned an industry certification. Students with an industry certification were 29.4 times more likely to be employed in an occupation related to their high school CTE program. Industry certifications also increased the likelihood of students transitioning to employment in a field unrelated to their high school CTE area as well. Students with an industry certification were 8.77 times more likely to be employed in an unrelated field than students who did not earn an industry certification. Conversely, students who did not earn an industry certification were more likely to pursue postsecondary education in a field unrelated to their high school CTE area than students who earned an industry certification ($OR = 5.751$).

Program Area.

Program area also had a significant relationship with the probability of student transition outcomes. Using the Transportation, Distribution, and Logistics program area as a reference category, Agriculture and Natural Resources ($p < .001$), Architecture and

Construction ($p = .008$), Business and Administration ($p = .021$), Human Services ($p < .001$), and Law and Public Safety ($p = .013$) all significantly predicted students transitioning to employment in a related field. Students taking Agriculture and Natural Resources (OR = 8.551), Business and Administration (OR = 2.996), and Human Services (OR = 5.494) were more likely to pursue employment in a related field than students in the reference category. Students in the Architecture and Construction (OR = .166) and Law and Public Safety (OR = .122) program areas were less likely than students in the reference category to pursue employment in a related field directly out of high school. Only one program area was a significant predictor for pursuing employment in an unrelated field. Students in Agriculture and Natural Resources (OR = 2.971, $p = .003$) were more likely to pursue employment in an unrelated field than students in the reference category.

In terms of pursuing postsecondary study in a related field, the program areas of Arts, A/V, and Communications (OR = 12.738, $p = .002$), Business and Administration (22.185, $p < .001$), Health Sciences (OR = 75.569, $p < .001$), Human Services (OR = 5.522, $p < .001$), Information Technology (OR = 9.245, $p < .001$), and Retail/Wholesale Sales and Services (OR = 5.882, $p = .003$) were all significant predictors. Students in these fields had an increased likelihood of pursuing postsecondary study in a related field than students in the reference category. The outcome of pursuing postsecondary study in an unrelated field also had multiple significant predictors. Students completing programs in Agriculture and Natural Resources (OR = 3.880, $p < .001$), Architecture and Construction (OR = 2.405, $p = .034$), Arts, A/V, and Communications (OR = 11.991, $p = .002$), Business and Administration (3.707, $p < .001$), Health Sciences (OR = 8.833, $p <$

.001), Human Services (OR = 4.143, $p < .001$), and Information Technology (OR = 4.954, $p = .001$) all had greater odds of transitioning to postsecondary study in a field unrelated to their high school CTE program than students in the reference category. There were no other statistically significant effects.

Research Question 4

The question under investigation was: Is there a significant difference between the estimated wage earnings for male and female CTE completers? The sample used for this analysis was the same subset of the full sample used for question three and included only students who were CTE completers and graduates. The rationale behind restricting the sample to completers was since the intent of CTE is to prepare students for postsecondary study or employment in a specific career field, then the only students who would be truly prepared would be high school seniors who were four-year completers of a CTE program. The assumption was that these students are at least somewhat committed to one specific occupational field and have been trained specifically for that field.

For this sample, initially, $N = 26,623$. A small subset of cases ($n = 100$) were determined to be outliers and were excluded from the analysis to keep the sample from violating the assumption of normality. The final sample for statistical analysis purposes was $N = 26,523$. Males accounted for 53.2% of the sample ($n = 14,117$) and females comprised 46.8% of the sample ($n = 12,406$). Estimated salary was calculated in a multistep process that involved ascertaining a mean wage for each program (occupation) based upon Bureau of Labor Statistics wage estimates and then averaging the program wages within each program area to derive an average estimated income for each program area.

Table 10 displays the descriptive statistics for this sample, including means and standard deviations.

Table 10

Means and Standard Deviations for Estimated Future Salary by Gender and Program Area

Program Area	N	Estimated Average Salary						Total	
		Male		N	Female		N	M	SD
		M	SD		M	SD			
Agriculture & Natural Resources	2558	63,058.46	5323.41	1611	64,015.74	5446.07	4169	63,428.38	5390.69
Architecture & Construction	1661	48,638.24	7111.53	146	50,972.26	11,757.70	1807	48,826.82	7615.08
Arts, A/V, & Communications	219	48,086.21	6845.91	224	46,381.34	7544.19	443	47,224.15	7249.71
Business & Administration	2791	49,679.91	21,531.55	2953	46,810.51	18,864.67	5744	48,204.74	20,253.59
Finance	9	36,640.00	0	29	36,640.00	0	38	36,640.00	0
Health Science	399	58,163.23	20,688.49	2838	47,115.09	21403.73	3237	48,476.91	21,621.06
Hospitality & Tourism	6	36,970.00	0	29	37,508.28	2898.70	35	37,416.00	2638.57
Human Services	630	47,145.10	4133.90	3247	44,062.56	7793.83	3877	44,563.46	7411.97
Information Technology	1021	72,095.90	11,590.94	307	69,219.25	10,621.50	1328	71,430.89	11,434.81
Law & Public Safety	76	49,275.95	2008.56	50	49,748.40	2060.54	126	49,463.43	2034.40
Manufacturing	1823	39,464.78	5661.05	123	39,955.77	7511.58	1946	39,495.82	5794.33
Retail/Wholesale Sales & Services	568	73,810.64	28,436.76	638	81,163.60	26,818.91	1206	77,700.51	27,824.51
STEM	855	84,411.20	5211.23	110	83,764.27	5058.21	965	84,337.46	5195.52
Transportation, Distribution & Logistics	1501	39,904.48	2948.59	101	41,538.61	9737.47	1602	40,007.51	3771.73
Total	14,117	54,404.70	18,730.38	12,406	50,940.70	19,055.95	26,653	52,784.43	18,730.38

The mean estimated salary for the entire sample was \$52,784.43. Males in the sample had a higher estimated future salary ($M = \$54,404.70$) than females ($M = \$50,940.70$). In terms of program areas, females displayed a higher mean wage than males in seven program areas (Agriculture and Natural Resources, Architecture and Construction, Hospitality and Tourism, Law and Public Safety, Manufacturing, Retail/Wholesale Sales and Services, and Transportation, Distribution, and Logistics) whereas males demonstrated a higher mean wage than females in six program areas (Arts, A/V, and Communications, Business and Administration, Health Sciences, Human Services, Information Technology, and STEM). Males tended to be more highly concentrated in areas such as Business and Administration ($n = 2791$), Agriculture and Natural Resources ($n = 2558$), Manufacturing ($n = 1823$), Architecture and Construction ($n = 1661$), and Transportation, Distribution, and Logistics ($n = 1501$). Females showed the greatest concentrations in fields such as Human Services ($n = 3247$), Business and Administration ($n = 2953$), Health Sciences ($n = 2838$), and Agriculture and Natural Resources ($n = 1611$).

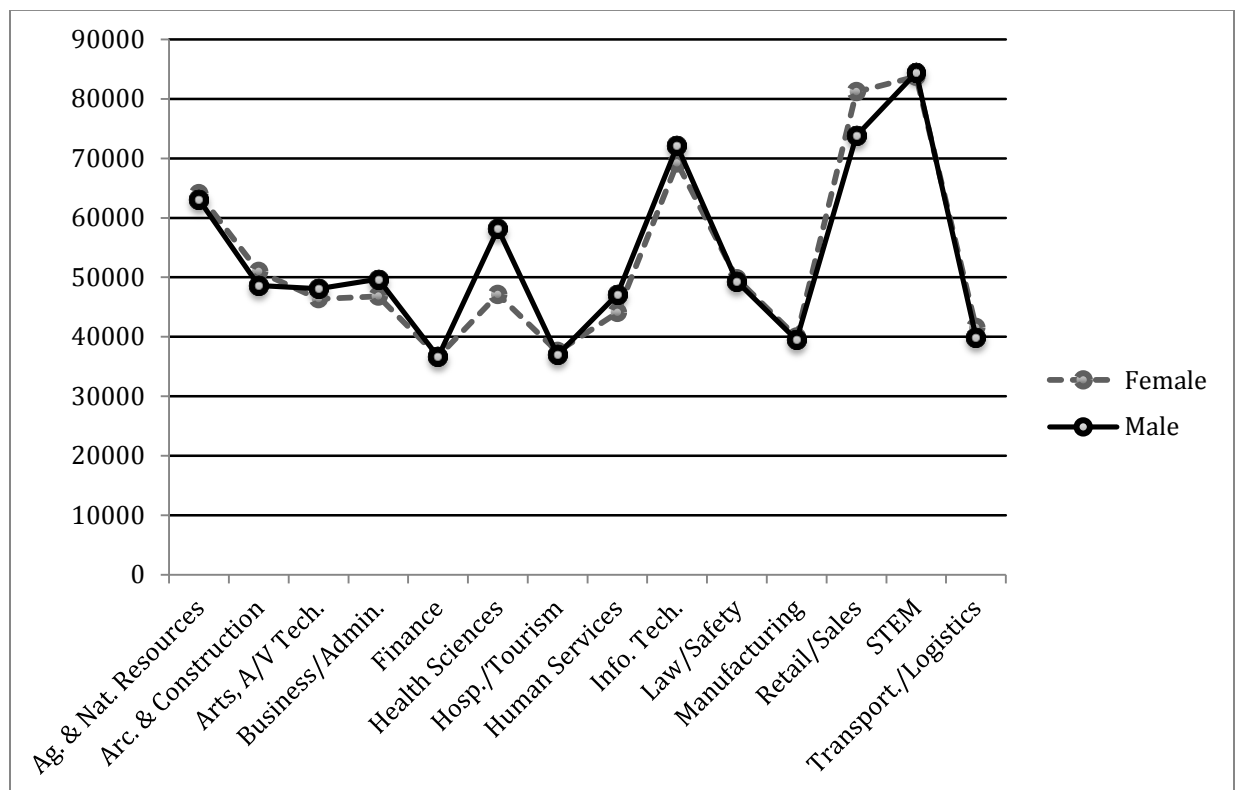
When comparing both wage and gender participation, two of the three highest paying fields were primarily male-concentrated (STEM, $n_{(\text{male})} = 855$, $n_{(\text{female})} = 110$; Information Technology, $n_{(\text{male})} = 1021$, $n_{(\text{female})} = 307$) and one was more female-concentrated (Retail/Wholesale Sales and Services, $n_{(\text{male})} = 568$, $n_{(\text{female})} = 638$). When comparing the participation levels for the lowest paying fields, two of the three fields were female-concentrated (Finance, $n_{(\text{male})} = 9$, $n_{(\text{female})} = 29$; Hospitality and Tourism, $n_{(\text{male})} = 6$, $n_{(\text{female})} = 29$) and one was male-concentrated (Manufacturing, $n_{(\text{male})} = 1823$, $n_{(\text{female})} = 123$). At first glance, it might seem counterintuitive that manufacturing was one

of the lowest paying fields, however, these estimates were derived from the average of the participants in the sample and might not represent the diversity within this industry that typically lends it to be a high-wage field. Also, it is important to note that the two lowest paying fields (Finance and Hospitality and Tourism) had the fewest participants for either gender.

Another way to approach the data is to compare the mean wages for males and females in a chart. Figure 1 displays the average estimated annual earnings for each program area.

Figure 1

Average Annual Earnings by Gender and Program Area



Based on the graph, male and female wages followed a similar trajectory for each of the 14 program areas. Although the average salary seemed to vary between program

areas, there did not appear to be much divergence between the salaries of males and females. The only obvious discrepancies were for Health Sciences, where male wages were greater, and Retail/Wholesale Sales and Services, where female wages were greater.

Prior to conducting the factorial ANOVA analysis, the assumptions of independence, normality, and homogeneity of variance were checked. All individuals in the sample were independently sampled and they do not influence one another's data points, thus it was concluded that the assumption of independence was met. In order to check for normality, the researcher examined a histogram of the dependent variable (estimated salary). As previously discussed, a small number of cases ($n = 100$) were determined to be outliers based upon the histogram and were subsequently excluded from the analysis in order to meet the assumption of normality. The final assumption, homogeneity of variance, was checked using the Levene statistic. Initially, Levene's test was significant ($p = .000$), suggesting that the assumption was not met. According to Keppel (1991), the most serious problem of violating the equal variance assumption is an inflated Type I error rate. In order to remedy the violation of this assumption, Keppel (1991) recommended using a more stringent alpha level, especially when the ratio of the largest to the smallest variances is greater than 3:1, which is the case for this data. Therefore, in light of the significant Levene statistic and in order to guard against potential Type I errors, the alpha level for this analysis was set at $p = .01$. Additionally, Field (2009) noted that unequal sample sizes can cause an issue with meeting this assumption and when sample sizes are large, Levene's test can produce significant results even where there are just small differences in group variances. Using this as a guide, one

option to remedy the issue was to combine several smaller groups with larger groups in order to minimize the effect of unequal groups.

Program areas with the smallest group sizes such as Finance ($n = 38$), Hospitality and Tourism ($n = 35$), and Law and Public Safety ($n = 126$) were reassessed to see if they could be combined with another program area. Based upon an analysis of the individual programs of study within each program area, it was determined that Finance should be combined with Business and Administration and Hospitality and Tourism and Law and Public Safety should be combined with Human Services for the purposes of this analysis. This left 11 total program areas instead of the initial 14. Although some group sizes remained unequal, it did not make a priori or logical sense to combine any more program areas.

A two-way ANOVA was conducted that examined the effect of gender and program area on estimated future salary. The results of the study are displayed in Table 11.

Table 11

Factorial ANOVA: Gender and Program Area on Estimated Salary

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η^2
Gender	1.550E+9	1	1.550E+9	7.497	.006*	.000
Program Area	2.163E+12	10	2.163E+11	1045.932	.000**	.283
Gender x Program Area	6.985E+10	10	6.985E+9	33.781	.000**	.013
Error	5.480E+12	26,501	206,790,267			
Total	9.305E+12	26,522				

Note. $N = 26,523$. $R^2 = .411$, Adjusted $R^2 = .411$

* $p < .01$, ** $p < .001$

The analysis revealed that there were both significant main effects and a significant interaction effect. The main effects of the variables gender $F(1, 26,523) = 7.497$, $p = .006$ and program area $F(10, 26,523) = 1045.932$, $p < .001$ were both significant at the more rigorous alpha level of .01. There was a statistically significant interaction between the effects of gender and program on salary, $F(10, 26,523) = 1045.932$, $p < .001$, indicating that the effect of program area on salary was not consistent for males and females. Based upon the significance of the results, all three null hypotheses should be rejected and it can be concluded that gender did have a significant effect on estimated future salary, program area had a significant on estimated future salary, and that the interaction between gender and program area was significant.

Further post-hoc analyses were conducted in order to isolate which groups contributed to the significance of the results. A simple main effects analysis revealed that

there was a significant difference in estimated salary between males and females in Business and Administration $F(1, 26,523) = 59.803, p < .001$, Health Sciences $F(1, 26,523) = 206.486, p < .001$, Human Services $F(1, 26,523) = 28.966, p < .001$, Information Technology $F(1, 26,523) = 9.445, p = .002$, and Retail/Wholesale Sales and Services $F(1, 26,523) = 78.563, p < .001$. There were no significant differences for males and females in Agriculture and Natural Resources, Architecture and Construction, Arts, A/V Technology, and Communications, Manufacturing, STEM, or Transportation, Distribution, and Logistics.

Although gender, program area, and the interaction between gender and program area all had a significant effect on estimated future salary, it is important to analyze the magnitude of these effects. The analysis revealed a disordinal interaction between gender and program area, meaning that gender differences in salary were dependent on program area. Given the nature of the interaction, main effects should not be interpreted independent of the interaction (Stevens, 2007), although they do merit reporting. The interaction between gender and program area produced a small effect ($\eta^2 = .013$), indicating that 1.3% of the variance in estimated future salary could be accounted for by knowing a person's gender and program area. The variable with the largest effect size was program area ($\eta^2 = .283$), which according to Cohen (1977) is a large effect. Also noteworthy was the effect size for gender. Although gender produced a significant main effect, the magnitude of this effect was extremely small ($\eta^2 = .000$), suggesting little practical significance. Given the minute effect size, it is quite possible that the significance of gender itself was a result of the large sample size rather than a true

measurable impact on the dependent variable. The main effects were not further interpreted due to the nature of the interaction.

CHAPTER V

DISCUSSION

The purpose of this study was to determine the extent of the relationships between gender and high school CTE coursetaking. Specifically, the study sought to understand the relationship between gender, nontraditional coursetaking patterns, earning industry certifications, student outcomes, and potential future earnings. Four research questions were posed in order to achieve the study's purpose. This chapter includes a review of the major findings of this study, a discussion of the results and their connection to existing literature, study implications, study limitations, and recommendations for future research.

Study Results

Gender and Coursetaking

The relationship between gender and coursetaking was analyzed in research question one: Is gender a significant predictor of nontraditional CTE coursetaking? Prior literature suggested that gender would be a significant predictor of nontraditional coursetaking, given the propensity of individuals to select gender-specific occupational fields and the results of this study confirmed this. It is worth noting, however, that while gender was a significant predictor of nontraditional coursetaking, the effect size was very small (Cox and Snell $R^2 = .003$, Nagelkerke $R^2 = .004$), indicating that gender is a weak predictor at best.

The finding of gender as a weak predictor of nontraditional coursetaking was an unexpected finding. Although the literature suggests that females are far more likely than males to take nontraditional courses, this was not the case in this current sample. Males were actually more likely to take nontraditional courses than females within this sample, potentially suggesting that measures aimed at increasing nontraditional participation and equalizing gender participation within career and technical education have made an impact. Additionally, based upon the effect size for gender, it appears that gender does not have the greatest influence on an individual's decision to pursue nontraditional CTE courses.

Gender and Industry Certifications

Research question two examined the relationship between gender and earning industry credentials. Although previous studies addressed the impact of industry credentials on student outcomes, there was little research regarding the impact of gender on earning these credentials. What little research did exist seemed to indicate that earning industry certifications benefit all CTE students and are especially advantageous for females (Kerckhoff & Bell, 1998). Within this current sample, just 15% of students earned some type of industry certification with females earning 56% of the total certifications earned.

The results of this study indicated that gender is a significant predictor of earning industry certifications. The likelihood of a female earning an industry certification is significantly greater than the odds of a male earning an industry certification. However, in terms of predictive ability, it can be concluded that gender is also a very weak predictor of earning industry certifications based upon the effect sizes found in the

analysis. It is evident that variables other than gender explain a much greater proportion of variance in certifications earned. For example, not all programs offer the potential to earn industry certifications to begin with, and even then student access could potentially be limited by a myriad of factors such as exam costs, availability at a specific school, and/or personal motivation or test-taking ability.

Nontraditional Student Outcomes

Predicting postsecondary outcomes for nontraditional CTE completers was the primary focus of research question three. This question was exploratory in nature and designed to capture the postsecondary transition patterns for nontraditional CTE students. The results of this study indicated that gender, industry certifications, and program area all had a significant relationship with the outcomes of nontraditional CTE students.

In terms of gender, the findings suggest that females are significantly more likely than males to pursue postsecondary study, either in a field related to their high school CTE program of study or into a new field altogether. This is consistent with prior research on postsecondary enrollment trends that have indicated that females are now more likely than males to attend college and attain degrees (NCES, 2012). It appears that the same matriculation pattern holds true for nontraditional CTE students as well. In addition, females in nontraditional CTE courses are also more likely than males to be employed in an occupation related to their high school CTE program of study after completing high school. Although the data did not indicate reasons as to why nontraditional females were more likely to seek employment in their field of study, possible explanations proffered by previous research suggest the potential for higher pay (Hogue et al., 2010), increased status and prestige (Teig & Susskind, 2008; Wilbourn &

Kee, 2010), and a greater societal acceptance of women in nontraditional careers (Lease, 2003; Wilbourn & Kee, 2010) could play a role in explaining why more females in the study were more likely to pursue employment in a nontraditional field.

As for industry certifications, the findings of this study indicated that students who obtained industry certifications were far more likely to be employed (either in a field related to their CTE program of study or in an unrelated field) than students who had not earned an industry certification. Students with an industry certification were 29.4 times more likely to be employed in an occupation related to their high school CTE program and 8.77 times more likely to be employed in an unrelated field than students who did not earn an industry certification. This gives credence to the findings from previous studies that have suggested that industry certifications have a positive impact on the outcomes of CTE students (Adelman, 2005; Kerckhoff & Bell, 1998). Earning an industry certification might very well serve as proof of an individual's technical capabilities as suggested by Bills & Wacker (2003), thus making a person a more attractive candidate to an employer, or it may also potentially signal an individual's increased commitment to a specific field of study. Pursuing an industry certification is purely voluntary since there is no requirement that a student pass an industry certification exam in order to be considered a "CTE completer." Students who do choose to take and pass certification exams might already be more committed to a specific field than students who do not pursue certification.

This theory of industry certifications as indicators of student commitment to a field of study is also supported by the findings regarding industry certifications and the likelihood of students pursuing postsecondary education in an unrelated field. The results

of this study indicated that students who did not earn an industry certification were 5.751 times more likely to pursue postsecondary education in a field unrelated to their high school CTE program of study. Perhaps their lack of earning an industry certification signaled a lack of commitment to that occupational field and a desire to pursue something else following graduation. However, it is important to note that since not all programs offer industry certifications upon completion of a sequence of courses, further investigation is warranted before drawing any concrete conclusions.

As expected, program area also had a significant impact on nontraditional student transition outcomes. Some fields of study more easily lend themselves to immediate career entry whereas others usually require additional postsecondary study before employment becomes an option. In one program area, Agriculture and Natural Resources, nontraditional students had higher likelihoods of transitions to all outcomes when compared with the reference group. It is also the only program area that significantly predicted employment in an unrelated field. It is worth noting that this program area also had more programs (11) than any other program area, which could indicate that students in this program area had more flexibility in career options, with some occupational fields leading directly to employment and others leading to additional postsecondary study.

For the outcome category that measured employment in a related field, nontraditional students in Agriculture and Natural Resources, Business and Administration, and Human Services all had greater odds of transitioning to employment in a related field than students in the reference category. It is important to consider that these three fields included both male and female nontraditional students. The other two

program areas that were significant predictors of employment in a related field, Architecture and Construction and Law and Public Safety, were comprised solely of nontraditional females. These students were significantly less likely to be employed in these fields, suggesting some form of continued occupational gender segregation within these areas. It is possible that some type of additional factor beyond gender (i.e. bias, discrimination, job availability, personal preference, etc.) is limiting nontraditional female employment in these specific fields.

Trends for postsecondary enrollment were slightly different. Most program areas that were significant predictors were significant for both postsecondary education in related and unrelated fields. Students in Agriculture and Natural Resources, Arts, A/V Technology, and Communications, Business Administration, Health Sciences, Human Services, and Information Technology were all more likely to transition to postsecondary study (either related or unrelated to their high school CTE field) than the reference group. This was consistent for program areas that had only female nontraditional completers (Arts, A/V, and Communications, and Information Technology) and only male nontraditional completers (Health Sciences). In fact, some of these single-gender nontraditional areas had some of the highest odds ratios of any group in the study. Males in the Health Sciences program area were significantly more likely to pursue postsecondary education in a Health Sciences-related field than students in the reference category (OR = 75.569). Likewise, females in the Arts, A/V, and Communications program area were significantly more likely to pursue postsecondary education in a related field than students in the reference category (OR = 12.738). These nontraditional students' willingness to continue following a nontraditional career path beyond high

school could be indicative of upcoming changes in the gender composition of careers and potentially suggests a movement away from occupational gender segregation toward increased gender parity in the workforce within certain occupational areas.

Gender, Program Area, and Estimated Future Salary

Research question four examined the impact of gender and program area on a CTE completer's estimated future salary. Existing research led the researcher to anticipate that gender would have a large effect on estimated future wages. These prior studies overwhelmingly suggest that there are significant pay inequalities for males and females; however, this assertion was not fully supported by the results of this study.

Despite not producing a compelling effect on its own, gender does play somewhat of a role when considered in conjunction with program area. The disordinal interaction produced by the data yielded a small effect that explained 1.3% of the variance in estimated salary. Follow up analyses revealed that the source of the significance was derived from five program areas. In four of the areas (Business and Administration, Health Sciences, Human Services, and Information Technology) salaries for males were significantly higher than salaries for females within the same program area. What is most striking about this result is that in three of these four areas, female participants outnumber males. Furthermore, in two areas (Business and Administration and Health Sciences) the majority of males are nontraditional students. Although the effect size is small, this still supports Budig's (2002) assertion that males out-earn females at all levels, even when males are the nontraditional participants. Such discrepancies in salary could potentially be contributing to the persistence of the gender wage gap, especially in areas where male participation is less, yet male salaries are higher. However, it is important to take into

consideration that the results of this study only support this assertion for a small number of program areas rather than for the entire sample.

Each of the two main effects for both gender and program area were significant; however, due to the disordinal nature of the interaction, they should not be interpreted independently. It is worth noting that gender had little practical significance, explaining 0% of the variance in salary. In essence, the magnitude of the effect was nonexistent and it can be concluded that the obtained significance was more a function of a large sample size rather than a true meaningful effect. Program area, however, did register as a large effect, accounting for 28.3% of the variance in salary. This was not surprising, given Blau and Kahn's (2007) research that found that industry category was one of the biggest indicators of contributing to wage differentials between males and females, accounting for 21.9% of the proportion of variance for salary in that study.

Study Implications

Given the sparseness of research available that uses recent data to explore the relationships among gender, coursetaking, and student outcomes amidst a legislative climate that has specifically targeted gender imbalances within CTE, this study was both valuable and timely.

The primary contribution of this study is that it provides a current perspective on the CTE coursetaking patterns of males and females. Specifically, study findings suggest that gender is a very weak predictor of nontraditional CTE coursetaking, which contradicts the majority of previous research findings. This suggests that gender stereotyping within CTE is diminishing and that the barriers to nontraditional enrollment that existed in the past are abating. The assumption of gender stratification within CTE

and its resulting effects implied by previous studies is not reflected in the results of this study. Efforts to increase nontraditional participation such as reforms, policies, and recruitment measures appear to be positively impacting student enrollment decisions. Perhaps introducing students to a variety of career options at earlier ages might further mitigate career-oriented gender stereotypes and encourage both males and females to pursue their interests rather than gender-compatible occupations.

The findings of this study in regards to gender and CTE coursetaking also have implications for the educational policy domain. Increasing gender equity has been one of the goals of several recent pieces of legislation and the results of this study indicate that gender segregation within CTE is lessening. Although this study does not quantify the impact of policy efforts, the findings do suggest that legislation may have contributed to an increase in gender equity. This is an important finding that can inform future efforts to reauthorize legislation such as the Carl D. Perkins Act that addresses equity within CTE. In addition, the findings of this study should also be used to inform CTE policy revisions and financial allocations at the state level as well. Based upon these results, it is recommended that policymakers continue to prioritize gender equity as the findings of this study indicate that legislation has positively impacted nontraditional enrollment in CTE courses. At the same time, education resources are often scarce and fiscal priorities other than gender might make a greater impact on the success of all students. This, too, would be perfectly reasonable given the limited influence of gender on course enrollment described in this study.

Another contribution of this study is the findings regarding gender, program area, and future salary and its potential impact on the gender wage gap. Study results suggest

that changes in CTE coursetaking patterns, including greater numbers of nontraditional participants, have an impact on potential future wage disparities. The implication is that program area, rather than gender, is an important factor in wage differentials. This suggests that the continuation of targeted recruitment to specific programs of study might prepare students for high-wage careers that will further narrow the existing gender wage gap.

The topics of gender participation and student outcomes in CTE also have implications for educational accountability. In addition to accountability measures required by Perkins IV legislation, individual states also have their own accountability measures by which districts and schools are evaluated. According to the U.S. Department of Education (2013), the goal of education in America is to “graduate from high school ready for college or a career” (p. 1). The Common Core Standards, a recent initiative to create consolidated national standards, were developed specifically with college and career readiness in mind (Common Core Standards Initiative, 2012). State accountability systems often include some component of college and career readiness as part of their overall accountability model. In Kentucky, for example, CTE coursework can contribute to whether or not a student is deemed career ready by state accountability standards that measure college and career readiness. Preparatory CTE students (those who have completed at least two CTE courses in a program and are enrolled in a third) that have earned an industry certification qualify as career ready. Students with “career ready” designations contribute to school, district, and state accountability scores (KDE, 2012). With college and career readiness being such an emphasis in terms of

accountability, CTE appears positioned to impact accountability measures for years to come.

Study Conclusions

Although gender is still a significant predictor in terms of CTE coursetaking, the results of this study indicate that it is a weak predictor, suggesting that the impact of gender on CTE participation has lessened. This could be one possible explanation for the findings regarding estimated future salary also contained within this study. This suggests that while gender remains a significant factor, parity in coursetaking and wages is slowly being reached. It appears that gender gaps in coursetaking and earnings are narrowing, which is consistent with the predictions of Blau and Khan (2007) who envisioned scenarios of potentially increased gender wage convergence (although not an outright vanishing of a gender wage gap) and Hayes (2011) who forecasted gender wage parity within the next several decades.

Previous authors have suggested that CTE remains a highly gender segregated sorting mechanism that perpetuates occupational gender segregation; however, the results of this study do not support these assertions. Many of these studies were conducted over a decade ago and did not make use of robust, empirically based data. Although rampant gender segregation might have been relevant then, Perkins IV legislation has been changed in recent years to specifically target gender inequities within CTE. The findings of this study suggest that although gender can still be used to predict student coursetaking patterns, its effects are rather minimal. If anything, student coursetaking patterns indicate that students seem to be embracing nontraditional opportunities across various program areas. Additionally, results pertaining to the transition outcomes of nontraditional

students suggest that although there are discrepancies amongst certain program areas, nontraditional students in general are fairly likely to persist in their field (either through employment or postsecondary study) or have some other type of positive outcome (postsecondary study in another field).

Although the study of industry certifications was not a central focus of this research, the findings pertaining to their impact on student outcomes should not be overlooked. Industry certifications not only predicted employment outcomes, but also suggest some type of higher-level commitment to a career field than coursetaking alone. If more programs of study begin to offer industry certifications in order to comply with Perkins IV goals, the impact of industry certifications on student outcomes might also be intensified.

The results of this study do not support gender by itself as the driving force behind CTE coursetaking decisions, which can subsequently impact a person's future salary provided they persist in that field. Although some salary discrepancies do exist between males and females within certain industry areas, one cannot assume that this is the result of gender stereotyping as the results concerning the negligible predictive ability of gender on coursetaking do not support this assertion. It appears that gender gaps within CTE coursetaking are narrowing and gives promise that equity goals envisioned by Perkins IV legislation might soon be realized.

Overall, the results of this study indicate that Perkins IV might have achieved some of its goals in regards to reducing gender inequality. This is potentially indicative of a larger sociological movement in society that has led to a reduction in the social differences between men and women. This social change has been documented in

previous research where studies have concluded that gender roles are changing. Choi et al. (2008) indicate that gender role endorsements are shifting away from rigid boundaries and trending toward moderation. Similar studies have suggested that gender role stereotypes are declining as a result of an increase in “the social desirability of masculine traits in women” (Choi et al., 2009, p. 703). The findings of this study indicating increased gender parity in workforce preparation courses support these assertions that the rigidity of gender roles and stereotypes are perhaps decreasing and suggests a trend toward greater social equality amongst males and females.

Additionally, recent studies have found that younger, primary school aged students are exhibiting career preferences that are less gender traditional than in the past. Blackhurst and Auger (2008) and Schuette et al.’s (2012) predictions that this might lead to a less gender-segregated workforce are also supported by the findings of this study. Not only was gender found to be a weak predictor of nontraditional coursetaking, female nontraditional students were also more likely than male nontraditional students to pursue employment in their field of study. This suggests that there will continue to be increased gender integration within previously male-dominated fields, supporting assertions that jobs will increasingly become gender neutral (Teig & Susskind, 2008). This could potentially have a trickle-down effect on narrowing the gender wage gap if women continue to enter formerly male-dominated fields that often provide the potential for increased pay.

True occupational gender equality would eventually lead to a scenario where nearly all occupations are gender neutral with a gender wage gap that is virtually nonexistent. Although such a situation is not likely to happen in the immediate future,

the possibility of a future where occupational gender equality exists is not outside the realm of possibility. The results of this study regarding male and female nontraditional participation suggest that the workforce of the future is poised to be more gender balanced than ever. If the societal trend of reduced gender role stereotypes observed in recent studies continues, this hypothesized future of gender neutrality in the workforce might be a reality sooner rather than later.

Study Limitations

As with any study, certain limitations inherent to the research design or sampling strategy exist. This particular study includes limitations such as generalizability, unreliability of measures, and the inability to control for extraneous variance. The sample for this study was limited to a single Midwestern state, thus limiting the generalizability of results nationwide. For example, the economic or ethnic profile of the students in the sample might not mirror the national secondary CTE population. Additionally, program and course offerings vary from state to state, which can again limit the ability to generalize results nationally. Another potential limitation exists due to data collection procedures. The dataset analyzed was provided by the state department of education, however, the state's database manual indicates that the data were collected by individuals at the local level and then reported to the state. This introduces potential collection and/or reporting errors into the sample. Also, some of the data collected for specific variables (student transition outcomes, for example) relied upon student self-reports, which could impact the reliability of the measures. Finally, the primary focus of the research was on the impact of gender on CTE coursetaking. The study could not account for all sources of extraneous variance such as factors or circumstances that might

have influenced student coursetaking patterns or outcomes. Following up the current study with a nationally representative sample that controls for additional factors could potentially give additional insight into this study's findings.

Future Research

The current study provides insight into the impact of gender on secondary CTE coursetaking, earning industry credentials, and student outcomes. Although this study can potentially add to the existing body of knowledge on this topic, future research should be conducted in order to replicate the findings of this study. Of particular use might be a study that uses a more nationally representative sample in order to maximize the generalizability of the results. As more districts and states move toward the use of electronic transcripts such as the National Student Clearinghouse and the collection of longitudinal datasets, obtaining a national sample that would allow researchers to track student participation in CTE should become easier.

One of the basic premises behind this study is that high school CTE programs prepare students for entry into specific occupational fields or for continued postsecondary study. It has been suggested that persistent gender segregation within CTE courses might act as a sorting mechanism that perpetuates the cycle of occupational gender segregation and the gender wage gap (Ainsworth & Roscigno, 2005; Compton, Laanan, & Starobin, 2010; Sayman, 2007). However, it would be imprudent to not question just how much of an impact that four high school CTE courses (a typical program of study) really have on an individual's future career field. The basic idea behind high school CTE is simple—to serve as a pathway to post-secondary education or skilled employment—but the reality of student outcomes is far more complex. Student transition rates to similar college majors

or occupational fields do not come close to reflecting high school CTE participation rates. Within this study, transition outcomes for either employment in the same CTE-related field or continued postsecondary study within that field totaled 49.36% for students in nontraditional programs. In a separate study of secondary CTE student transitions, Alfeld & Bhattacharya (2012) found that just 17% of high school seniors enrolled in the same program of study at the postsecondary level following graduation.

Few studies explicitly address student transition outcomes from secondary CTE programs of study to employment or postsecondary study within similar fields. There is clearly a need for future research in this area, however, current CTE policy presumes that students will begin a certain career path early in high school and persist in that field throughout adult life as well. Especially in terms of nontraditional participation, the theory is that if more students are recruited to nontraditional programs, then subsequently, more students will finish nontraditional programs, seek out jobs in nontraditional fields, thus bringing about increased gender balance within the workforce (Blackhurst & Auger, 2008; Teig & Susskind, 2008; Wilbourn & Kee, 2010). However, based upon what is known about student transitions, this calls into question the practicality of such policy expectations. Although policies can be in place to encourage increased nontraditional participation and recruitment, the literature suggests that such programs still face an uphill battle of overcoming a minimum of 14 years of gender socialization. By the time a student has reached high school, they have likely already begun selecting and eliminating potential careers based upon their gendered self-concept (Gottfredson, 1981), possibly making the option of participating in a nontraditional pathway a tough sell.

Although the current legislative goals of CTE revolve around continued postsecondary study or entry into specific career fields, it appears that future goals reflecting a more global employability focus might emerge. In *Investing in America's Future: A Blueprint for Transforming Career and Technical Education* (2012), the U.S. Department of Education champions CTE as “Not just skills for a single job but skills for a lifetime of career and community service” (p. 7). It appears that the next reauthorization of the Carl D. Perkins Career and Technical Education Improvement Act may place a greater emphasis on transferable skills that will allow students to switch between jobs fields in order to maximize career success as opposed to the current model that emphasizes narrow occupational field selections.

Since not all students continue in their exact high school CTE career path for employment or postsecondary study, they can still acquire soft skills that will allow them to succeed in multiple disciplines. Brown (2002) refers to these skills as “transferable skills” or “generic skills,” explaining that while students learn specific technical skills in CTE courses, it’s the ability to apply experiences and demonstrate general occupational skills in real world settings that will determine their ability to succeed in their given field. The importance of these employability skills cannot be understated. Richens and McClain (2000) surveyed over 400 employers concerning their preference for certain skill competencies for entry-level workers, finding that employability skills were consistently rated as the most preferred quality, even ahead of technological capacity. Bronson (2007) suggests that the real-world aspect of CTE programs is what allows its students to develop these types of transferable skills. Perhaps future research could focus on a broader category of student transition outcomes (successful college or career

placement) as opposed to the more narrowly defined transition categories that currently exist.

Quantitative studies such as this one can answer many questions about CTE participation—especially in regards to gender, demographics, and student outcomes—but a lingering follow up question remains to be answered—Why? Why do students take an average of four courses dedicated to a career major or program of study, complete work based learning and co-op experiences, earn industry certifications, and then just stop? For the students who do continue their education or accept a job in their chosen technical field, what makes them different than the students who chose not to? What is the underlying motivation behind each of their decisions? Such research would require a qualitative or mixed methods approach not employed in this current study; however, understanding the student decision-making process and how it impacts student outcomes seems to be the logical next step in CTE research.

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APPENDIX A

Summary of Sex and Gender Literature

The literature review presented a number of studies in order to conceptualize the historical development of research concerning sex and gender. The presentation of a table of relevant findings is utilized as a method to efficiently summarize the literature.

Table A1

Summary of Sex and Gender Literature

Authors	Publication Year	Major Findings
Terman & Miles	1936	Masculinity and femininity are two bipolar opposites.
Constantinople	1973	Contradicted the assumption that masculinity and femininity were just unidimensional constructs because available data suggested multidimensionality.
Bem	1974	Disputed the belief of a single masculinity or femininity continuum. Introduced a sex-role inventory that also calculated androgyny.
Spence, Helmreich, & Stapp	1974	Masculinity and femininity are not bipolar opposites. Developed the personal attributes questionnaire to assess various masculine and feminine traits.
Edwards & Spence	1987	Gender identity is a multi-factor structure. Gender-specific attitudes, actions, and beliefs are not always

		interrelated and do not necessarily predict gender identity.
Eagly	1997	Society places gender stereotypic expectancies on men's and women's behavior. Men are agentic; women are communal.
Bussey & Bandura	1999	Gender is developed based upon biological, psychological, and social factors.
Choi et al.	2007, 2008, 2009	A three-factor structure of gender roles exists—Personal Masculinity, Social Masculinity, and Femininity. This suggests that gender roles are less rigid and becoming increasingly blurred.
Tobin et al.	2010	Children become aware of their gender group membership and its associated behaviors by ages 3 or 4. Environmental and biological factors contribute to the formation of a gender identity.

APPENDIX B

Summary of Gender Stereotypes Literature

The literature review presented multiple studies as a means to place gender stereotyping within the greater context of occupational and career decision-making. The presentation of a table of relevant findings is utilized as a method to efficiently summarize the literature.

Table A2

Summary of Gender Stereotypes Literature

Authors	Publication Year	Major Findings
Clarey	1985	Gender roles can be modified through counseling treatment. Resocialization can help people develop an identity based upon the situation rather than reacting based upon gender roles.
Hayes	1986, 1989	Male-typed jobs are a way for women to achieve greater monetary and psychological rewards. When women pursue male-traditional jobs, it creates vacancies in female-dominated fields, opening the door for male nontraditional employment.
Couch & Sigler	2001	Gender-stereotypic occupations remain prevalent due to gender assumptions that are ingrained in society. Perceptions of gender-appropriate careers are abundant, with masculine professions associated with control or

		power and feminine occupations perceived to have a caregiving slant.
Heilman	2001	Gender roles are prescriptive and establish various social prohibitions on certain behaviors for males and females.
Correll	2004	People form career aspirations based in part on self-perception of their competence at various tasks. Competency beliefs can be biased if a person believes that one gender has a greater advantage at a task than the other.
Andrews & Ridenour	2006	As people became more aware of the negative effects of gender stereotypes, they began to adopt more gender fair practices and decrease the instances of stereotyping.
Jacobs, Chhin, & Bleeker	2006	Parental expectations can predict whether their children will pursue a gender traditional or nontraditional occupation.
Schuetz, Ponton, & Charlton	2006	A significant relationship exists between working male adults the occupational aspirations of boys living with them. Gender stereotypes still have an impact on boys' future occupations.
Heilman & Okimoto	2007	Women who are successful in male domains are often penalized socially because they violate gender stereotypes.
Mastekaasa & Smeby	2008	Students who select majors in gender traditional fields exhibit a preference for gender traditionality during their childhood or youth years.
Oswald	2008	Women who are more strongly gender identified are more susceptible to

		stereotype threats. Stereotype activation contributes to women's perceived ability to be successful in feminine-typed occupations and might explain why women are drawn to more traditionally feminine occupations.
Evans & Diekman	2009	Gender beliefs and internalized gender roles explain gender differences in goals and career interests between men and women. Men tend to prefer status goals and women tend to prefer caregiving roles.
Patterson	2012	Children use gender-role knowledge to make judgments about themselves in terms of activity and occupational preferences as early as elementary school.

APPENDIX C

Summary of Gender and Occupation Literature

The current literature review presented a number of studies in order explicate how gender influences occupation. The presentation of a table of relevant findings is utilized as a method to efficiently summarize the literature.

Table A3

Summary of Gender and Occupation Literature

Authors	Publication Year	Major Findings
Gottfredson	1981	Developed theory of circumscription and compromise that explains how people both select and eliminate potential careers based upon their gendered self-concept.
Chusmir & Koberg	1988	Women seek out gender traditional occupations in order to avoid gender role conflict.
Acker	1990	Organizations themselves are gendered, which results in occupations that are gendered.
Marini et al.	1996	Gender is the top influence on occupational values.
Budig	2002	Responsibilities outside of work are perceived as distractions for women and have a negative impact on wages. The reverse is true for men because they are perceived as providers.

Acker	2006	The “ideal worker” is presumed to be male because males are assumed to have fewer responsibilities outside of work.
Hakim	2006	Developed preference theory that suggests career selection involves choice in order to meet work/life balance needs.
Still	2006	An opt out revolution exists where educated women chose to leave the workforce when they have children.
Teig & Susskind	2008	Females prefer female-dominated occupations more than males prefer male-dominated occupations.
Evans & Diekman	2009	Values (such as desire for power or caregiving) can influence career paths but do not predict an avoidance of nontraditional careers.
Weisgram et al.	2010	Interest for certain occupations is affected when a person knows that field’s gender type.
Weisgram et al.	2011	Gender barriers get crossed when men and women hold nontraditional values.
Hegewisch et al.	2012	A gender wage gap continues to exist. Women earn approximately 82% of what men earn.
U.S. Census Bureau	2012	Approximately 80% of jobs can be classified as either male- or female-dominated.
Marlene	2013	Enforcing equal opportunity laws, creating family friendly policies, and increasing wages in female-dominated fields could help close the gender wage gap.

APPENDIX D

Summary of Nontraditional Careers Literature

The current literature review presented multiple studies as a means to explain the prevalence of, the motivations behind, and the barriers to the pursuit of nontraditional employment. The presentation of a table of relevant findings is utilized as a method to efficiently summarize the literature.

Table A4

Summary of Nontraditional Careers Literature

Authors	Publication Year	Major Findings
Kanter	1977	Developed theory of tokenism that suggests minority subgroups within a workplace are more likely to have negative experiences because of perceived differences from the majority.
Hayes	1986	Women were initially encouraged to pursue male-dominated careers to achieve monetary and psychological benefits.
Wharton & Baron	1987	Men have greater levels of job satisfaction in female-dominated occupations over gender-neutral occupations due to a man's higher social standing.
Chusmir	1990	Men who chose nontraditional careers are often negatively perceived.

Young & James	2001	Males have less job satisfaction in nontraditional work because of role ambiguity, lack of job fit, and lower self-esteem.
Steele et al.	2002	Undergraduate women in nontraditional fields are more likely to change majors than others due to the influence of gender stereotypes.
Lease	2003	Men who choose nontraditional careers have lower status needs and different values.
Simpson	2005	Males in nontraditional careers struggle with the conflict between the need to preserve their masculine identity with the female demands of the job.
Eardley & Manvell	2006	Women face issues such as bias in career counseling, sex discrimination in course enrollment, and sexual harassment when they aspire to a career in a traditionally male field.
Blackhurst & Auger	2008	Earlier career preparation programs that expose students to a variety of options could increase the pursuit of nontraditional careers.
Teig & Susskind	2008	High status jobs are increasingly becoming gender-neutral, shifting the basis for occupational decisions away from gender.
Bona et al.	2010	Women who pursue nontraditional careers tend to have a higher interest in math and science and parents that do not model traditional gender stereotypes.
Hogue et al.	2010	Students who plan to pursue male-dominated occupations have higher pay expectancies than students who plan to pursue female-dominated occupations.

Wilbourn & Kee	2010	Efforts to encourage females to pursue nontraditional occupations suggest that female-dominated occupations are lower status and a downgrade for males that might pursue them.
Sobriaj et al.	2011	Male job satisfaction in nontraditional careers is inversely related to social stressors in their work environment.

APPENDIX E

Summary of CTE and Coursetaking Literature

The current literature review presented numerous studies as a means to place CTE coursetaking within the greater context of occupational and career preparation. The presentation of a table of relevant findings is utilized as a method to efficiently summarize the literature.

Table A5

Summary of CTE and Coursetaking Literature

Authors	Publication Year	Major Findings
Kerckhoff & Bell	1998	Earning vocational credentials has a positive impact on student outcomes. Women experience a greater benefit than men.
Ainsworth & Roscigno	2005	Females are more likely to take CTE courses in low wage fields.
NWLC	2005	Female CTE students are overrepresented in courses in traditional female fields and underrepresented in courses pertaining to traditionally male fields, limiting access to higher paying careers.
Adelman	2006	Coursetaking in high school impacts postsecondary degree attainment.
Eardley & Manvell	2006	CTE enrollment is segregated along gender lines. The earnings potential for students in male-dominated programs is

		much higher than the potential earnings from female-dominate fields.
Lufkin et al.	2007	CTE programs do not promote gender equality and reflect occupational segregation in the labor market.
Sayman	2007	CTE has not eliminated gender bias or gender stereotyping.
Kemple	2008	Male career academy students experience positive labor market outcomes following high school; females do not experience a significant earnings outcome.
Tenenbaum	2009	Parents make gender stereotyped course selections for their children and do not encourage gender nontraditional courses.
Compton et al.	2010	Female CTE program completers receive lower wages than men, even if they attain a higher degree.
Ma	2011	A positive association exists between high school math and science coursetaking and earning a STEM degree in college. Suggested that taking gender nontraditional courses in high school is one potential way to increase nontraditional degree attainment in college.

APPENDIX F



Human Subjects Protection Program Office
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DATE: December 11, 2013
TO: Namok Choi
FROM: The University of Louisville Institutional Review Board
IRB#: 13.0826
STUDY TITLE: **Career and Technical Education and Gender Stereotyping: Exploring Relationships Among Gender, Course taking, and Outcomes of High School CTE Students**
REFERENCE #: 329578
DATE OF REVIEW: 12/10/2013
IRB STAFF CONTACT: Name: Jacqueline S. Powell
Phone: 852-4101
Email: jspowe01@Louisville.edu

This study was reviewed on 12/10/2013 and determined by a designated member of the Institutional Review Board that the study is exempt according to 45 CFR 46.101(b) under category 4: Existing data/specimens, publicly available, un-linkable to individuals.

Documents/Attachments reviewed and approved:

Submission Components			
Submission Form			
Form Name		Outcome	
Initial Review Submission Packet		Exempt	
Study Application			
Form Name		Outcome	
IRB Study Application		Exempt	
Study Document			
Title	Version Number	Version Date	Outcome
Dissertation Proposal	Version 1.0	11/26/2013	

The IRB has granted a waiver of informed consent.

Please be advised that any study documents submitted with this protocol should be used in the form in which they were approved.

Since this study has been approved under the exempt category indicated above, no additional reporting, such as submission of Progress Reports for continuation reviews, is needed. If your research focus or activities change, please submit an Amendment to the IRB for review to ensure that the indicated exempt category still applies. Best wishes for a successful study. Please send all inquiries to our office email address at hspofc@louisville.edu

Thank you for your submission.

Sincerely,



S. Lee Ridner, PhD

Social/Behavioral/Education Institutional Review Board Member

SLR/jsp

*Full Accreditation since June 2005 by the Association for the Accreditation of
Human Research Protection Programs, Inc.*



CURRICULUM VITA

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EDUCATION

University of Louisville

**Ph.D. in Educational Leadership and Organizational
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(Anticipated) 2014

Dissertation: Gender Stereotyping and Career and Technical

Education: Exploring the Relationships Among Gender,

Coursetaking, and Outcomes of High School CTE Students

Honors: Passed Comprehensive Exams with Honors, Graduate Dean's Citation

University of Louisville

Rank I in Education

2011

University of Louisville

M.Ed. in Education Administration

2009

Area of Concentration: K-12 Principal Certification

Indiana University Southeast

B.S. in Secondary Education

2004

Areas of Concentration: English and Communication

Honors: Graduated Summa Cum Laude

Western Kentucky University

B.A. in Broadcasting

2001

Areas of Concentration: Radio and TV Operations

Minor: Marketing

Thesis: "The Media Violence Debate"

Honors: Graduated Magna Cum Laude

TEACHING EXPERIENCE

Jefferson County Public Schools, Louisville, KY

Assistant Principal

2012-present

Analyzed student testing data, conducted teacher evaluations,
administered discipline, led professional development sessions,
supervised day to day operations.

Teacher—Radio, TV, and Print Journalism, English 9-11

2005-2012

Wrote curriculum, developed syllabus and course structure, administered grades.

RELATED EXPERIENCE

Jefferson County Public Schools, Louisville, KY

CTE Liaison

2010 – 2012

Coordinated technical program assessments and data collection, managed school Perkins budget

PLC Facilitator

2010 – 2012

Served as department curriculum and instruction leader. Conducted weekly meetings focused on instruction, data analysis, and assessment.

PUBLICATIONS AND PAPERS

“Data Days and PLCs at Fern Creek Traditional High School”

Round table presentation at the National High Schools That Work Staff Development Conference

2012

“Starting a High School Radio Station”

Presenter at the Kentucky High School Journalism Association State Convention

2007

MEMBERSHIPS

Jefferson County Assistant Principals Association

Kentucky High School Journalism Association